RAILROAD GAZETTE

FRIDAY, SEPTEMBER 2, 1898.

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The Providence Passenger Station—A Correction.

The plans for this station (Railroad Gazette, Aug. 5), were made by Mr. E. P. Dawley, M. Am. Soc. C. E., and Mr. Geo. B. Francis, M. Am. Soc. C. E., as stated in the Railroad Gazette of Oct. 1, 1897. In copying this statement for the description printed four weeks ago, the name of Mr. Francis was omitted through mere carelessness. The first work on these plans was done nine years ago, before the New York, Providence & Boston, of which Mr. Dawley was then Chief Engineer, had been absorbed by the New York, New Haven & Hartford. Mr. Francis was assistant to Mr. Dawley, and the plan was largely prepared by him. In 1892 he was appointed Resident Engineer of the Terminal Company, reporting to Mr. Dawley. He has since been made Resident Engineer of the Boston Terminal Company, building the great South Union station in that city. The trainshed controversy between the city of Providence and the railroad company led to modifications of the Providence plans, and the general plan as finally built was prepared under the direction of Mr. Francis. The governing ideas may be fairly divided between Mr. Dawley and Mr. Francis. The final detail plans were made in Mr. Dawley's office and the erection was under his direction. In considering these plans it must be remembered that it had to be a compromise, not only with physical conditions, but with the demands of several parties.

Contributions.

Electricity on the Metropolitan Underground—London.

London, Aug. 19.

To the Editor of the Railroad Gazette:

In reply to your letter of 8th inst. regarding the use of electricity for the experiments on the Metropolitan underground line, I beg to say that all the information obtainable in this matter is as follows:

It is understood that the plant for the Earl's Court and High street, Kensington stations, is to be put down at once in order that more exact data may be obtained than are at present possessed, and also for the purpose of familiarizing some of the railroad officials and staff with the ins and outs of the use of electric locomotives or other heavy electric railroad plant. I know that the generating plant is intended to be of such a size as to make it capable of being employed as a unit in the permanent power plant which it is hoped will be eventually installed for the entire Metropolitan and Metropolitan District systems as the outcome of the present experiments. One point in particular that will arise will be the effect upon the system of steam locomotives owned by other companies running over the Metropolitan lines when they have been converted for the purpose of electrical working.

Further than this it is at the moment impossible to go, as, if anything has been actually decided by the board or the technical advisers on the questions of contractors for the electrical equipment, or details of the plant, or track work, or locomotive particulars, no one will be allowed to get at the facts so long as it is possible to keep them quiet. This matter is so absorbingly interesting on this side that there are very many technical men in London who would be only too glad to be able to learn something on these points.* B.

*For notes of the progress and status of this important scheme see the Railroad Gazette of Sept. 3, 1897, page 614; Feb. 4, Feb. 11, April 8, June 3, pages 77, 100, 261, 391.

Specifications for Air Brake Hose.

Peerless Rubber Manufacturing Co.
New York, August 29, 1898.

To the Editor of the Railroad Gazette:

This company is much interested in the article by Mr. G. T. Campbell in your last issue on the subject of specifications for air brake hose, and will say that Mr. Campbell evidently has not gone as thoroughly into the compounding process in the manufacture of rubber, whether for air brake hose or other purposes, as has Mr. Waitt. This is apparent by Mr. Campbell's simply suggesting that Mr. Waitt visit some rubber store and investigate sheet packing.

The so-called rubber sheet packing may be purchased anywhere from five cents to one dollar and fifty cents per pound. The makers of the five cent packing do not claim that there is any rubber in it. Mr. Campbell will find that the rubber for a first-class air brake hose and that for a cheap packing are manufactured on an entirely different basis, and are in no respects similar. Mr. Waitt has visited most of the large rubber factories in this country, and to our personal knowledge has watched the process of the manufacture of rubber hose and packing from beginning to end, commencing with the grinding and mixing up, to the vulcanizing and stripping, and is without doubt a very good authority to-day, as the factories, including our own, gave him as the representative of the M. C. B. Association, every opportunity to learn what many years' experience had taught were the best methods of producing the most durable material for the purpose.

Mr. Campbell's assertion that cheap non-elastic rubber is as durable for hose to withstand mechanical action as a strong fibre rubber of excellent quality is simply at varience with the experience of many years' test. He further states that a 40-cent hose will wear as long as a 60-cent hose. We would be very glad to take issue with Mr. Campbell on this point, and will say that this company will gladly fit up one end each of from 1,000 to 5,000 cars with 60-cent hose, as against 40-cent hose on the other end of the same number of cars, both thereby getting the same service; and in case the 60-cent hose does not outwear the 40-cent hose at least 40 per cent., we will not render a bill for any portion of it.

We, however, fully agree with Mr. Campbell on using the hose nipple cap on the end of the iron shank or nipple of the air brake coupling. This company put such a nipple on the market in October, 1897, and we believe we are fully justified in saying it prolongs the life of air brake hose of any make from 45 to 50 per cent; it certainly prevents the cutting referred to in Mr. Campbell's letter.

Mr. Campbell further condemns the friction test. There is no other reliable test known as to the quality of friction in hose and belting, other than the friction test, not even to a rubber manufacturer. The superintendent of a rubber mill, in making his friction compounds, depends solely upon the strength of his friction after it is vulcanized to determine the excellence and grade of his friction—there is no other way to determine it. Surely no one can claim a friction that will not stand over one or two pounds pull to the square inch is as good as one that will stand 10 or 15 pounds.

This company would be very glad to extend the same courtesy to the representative of any railroad company that has been extended to Mr. Waitt, and believe we can convince any one that both the friction and stretching tests in the rubber of air brake hose and belting, and, in fact, in cloth inserted packing, if you choose, is the most reliable test as to the strength and quality of the material—actual service test, of course, determines the balance, and, as we said in a former letter, the hose that has given years of continuous service and made the best records known for life and durability, is manufactured to comply strictly to this friction and stretching test.

So far as the Government test being absurd, we find that the Government tests, so far as rubber goods are concerned, have always been such as to call for strictly first-class material. We do not claim that they have always obtained it, but that was due to carelessness of the servants of the Government in accepting material that did not come up to their specifications. It would be interesting, to say the least, to have any one attempt to put any of these cheap materials that will not stand the Government tests into the Brooklyn Navy Yard to-day.

PEERLESS RUBBER MANUFACTURING CO.

The Application of Alternating Currents to Electric Traction.

The subject of the application of alternating currents for transmitting electrical energy is by no means a new one; its advantages and disadvantages when applied to electric railroads are, however, open to some misconception. A few facts condensed from a paper in the Engineering Magazine by Messrs. C. H. Davis and H. C. Forbes may prove of service to those contemplating the adoption of alternating in preference to direct current machinery.

Assuming every other condition of maintenance and operation to be the same, and as economical in one case as the other, then that method of generation which produces the cheapest power at the rim of the driving wheels and not at its source is the one to use. In other words, the problem is not one of the original cost of the power, but rather one concerning the concentration of power and its long distance transmission coupled with a cheap source, versus the running of small isolated units. The advantages of multiphase currents are summarized thus: (1) They allow some control of the speed of motors; (2) they provide for starting motors when loaded, but not when overloaded, to the same extent as direct current motors; (3) they facilitate insulation; (4) they overcome some of the effects of induction; (5) they reduce the cost of conductors.

The induction motor, like the synchronous motor, presents the difficulties of starting under loads and a perfect control of the speed. The two-phase and three-phase induction motors have overcome these difficulties to a certain extent, and they offer the following improvements over direct-current motors: (1) They require less attention; (2) they give less trouble from dirt, dust, or water; (3) they have no commutator; (4) they have no moving electrical contacts (except in special cases); (5) there is less danger of burning out armatures; (6) they require renewal of parts less frequently. The disadvantages in their use can be summarized thus: (1) They do not readily start with over-loads; (2) their speed cannot readily be controlled; (3) their efficiency is lower. At present the advantages are not equal in importance to the disadvantages, in so far as the question of railroad work is concerned.

Alternating currents are better adapted than direct currents for transmitting power over long distances, because with the use of the latter it is necessary to limit the output to comparatively low pressures, either in the generating plant or in the motors; while with the former it is possible to convert the current and thus use between the generator and the motor higher pressures than would be safe at either end.

The difficulties of transmission are principally those of insulation. The Niagara Falls transmission line carries electricity at 11,000 volts, and it is proposed to double this electrical pressure. Owing to the success of using transformers of large capacity, these high pressures offer no special difficulty in the utilization of the current. Voltage can be changed from a very high tension to a very low one, or vice versa, with comparatively a very small loss of energy.

In electrical railroad work, the power cost is but a small percentage (about 11½) of the total operating expenses, so that a small reduction in the generation of the power may not result in a large saving in the working expenses of the plant. Referring directly to the question of large steam roads adopting electricity as a motive power, the authors state that "while in general present trunk lines cannot now be profitably converted to electric traction, even by the use of alternating currents, parts of such systems may be, and where a new line is to be built or where very high speeds and short headways are required it will be advisable to consider electric traction."

Storage Batteries for Street Railroad Work.

According to figures collected by Mr. Joseph Appleton,* in 1897 the plates of the storage batteries used in this country weighed about 3,607,300 lbs.; in 1896 this figure was 2,315,300 lbs., and this in turn was an increase over 1895 of 1,202,500 lbs. In 1894 the weight was about one-third only of the weight of the plates used in 1895. On this basis, which is a fair one from which comparisons may be drawn, the storage battery industry is steadily on the increase.

At the Niagara Falls power plant the electrical energy is sold at a certain rate per h. p. per year, and this is $40, more or less, according to the amount taken. The power, however, is available for 24 hours each day, so that if a man requires every day but 10 hours it costs him 2.4 times as much to run his machinery as it would if he were able to use it 24 hours a day, but by using a storage battery in connection with the power thus supplied he would be able to get along with probably half the amount. For example, if a company requires 300 h. p. for 10 hours a day, he must necessarily pay for 300 h. p. for 24 hours, or 7,200 h. p. hours; while he can use but 3,000 h. p. hours, and his average will probably be less than this. With a storage battery capable of storing 150 h. p. for 10 hours he will need to pay only about one-half the average amount required, as the battery will furnish approximately the remaining half. The battery, of course, will be charged during the hours when the machinery is not being used. A further general reference to this question will be found in the paper.

The Buffalo Street Railway Co. recently completed a plant to run on very much the same principle as outlined above. This company runs practically all the cars within the city and has a steam plant capable of delivering about 7,000 elec. h. p. and 2,000 h. p. in two-phase rotary transformers. These are supplied with high tension alternating current from the Niagara Falls plant. The storage battery plant has a capacity of 1,200 h. p. for one hour, but the cells are made so that the capacity can be increased 2,000 h. p. for an hour. This was done by means of in-

*Proceedings of the Engineers' Club, Philadelphia, for August, 1898, p. 178.

creasing the size of the cells so that plates can be added to absorb the additional power. This plant works in connection with a booster which compounds the current to any desired extent. The battery takes care of all the fluctuations and peaks. The rapid fluctuations cannot be seen on the slide, as the curve was plotted from observations taken every fifteen minutes, which will not show the rapid variations. It is alternately charging and discharging during the day time, as the load varies, but receives its full charge at night from the converters. It is apparent how large a proportion of the load has been transformed from the steam plant to the rotary converters, by means of the battery, thereby greatly increasing the average power obtained from them.

As yet the battery plant has not been running sufficiently long to ascertain the actual saving, but so far the coal consumption is believed to have been reduced some 25 per cent. and the working force has been reduced by five men.

Central Station Economics—I.

By William D. Ennis, M. E.

The losses in an electric railroad power station are chargeable to many causes, which may be grouped under the two general classes of (1) operation and (2) management. The customary definition attached to these two terms may seem too limited to allow of their being used in a general sense, and it may be added in explanation that the first class of causes comprises the inefficiency of individual machines and employees, and the second class, unintelligent adjustment of the equipment to the work to be done.

Operative causes tending toward wastefulness in central station work have been studied in detail and discussed at length by various writers and managers, and are being gradually eliminated. The history of electric railroading, as it has developed during the past ten years, displays a constant increase in the efficiency of the various units, boilers, engines, generators and men, that go to make up the power station. Efficiency in management has of late come to the front as a subject of investigation, and the modern superintendent or mechanical engineer is compelled to study from his own experience and from his observation of the experience of others, ways and means of making gains that in the early days of the business were seldom thought of. The two classes of economies rising from the causes above distinguished, have been developed separately, and any discussion of them is simplified by considering them apart from each other.

I.—Operative Economies.

The larger part of the progress that has been made in the economical generation of electric current during the first ten years of railroad work has been due to improvement of, and addition to, mechanical apparatus. Such apparatus may be grouped under the classes of (a) steam producing, (b) steam utilizing, (c) current generating.

In the first class, in the way of improvements there have been introduced water-tube boilers, automatic grates, and better principles of design for boilers, feed water heaters and pumps, resulting in dry steam, full utilization of the heat of exhaust steam and less wasteful auxiliary apparatus.

Additions to boiler room equipment that may be mentioned are coal handling machinery, apparatus for producing mechanical draft, damper regulators, fuel economizers, and the recently proposed heating of feed water by live steam, which in many cases has been proven to be a distinct source of economy.

The steam boiler, considered as a mechanism, is unique in its adaptability to widely varying loads. That there is a load of maximum efficiency is not doubted. The amount of that load has been determined in various individual cases, and has been shown to be often far from the rated load.* The advantage of the adaptability of the boiler to a broad range of working can be fully realized only by the use of some form of mechanical draft. In tests made by the writer on six horizontal tubular boilers at the electric station of the Consolidated Gas Co. of New Jersey it was found that the boilers were working at 60 per cent. and less, of their rating. When a recommendation was made that the boilers should be run at full load, it was discovered not only that a lower efficiency would result, but that it was impossible to sustain the load for which the boilers were rated. The difficulty was in the stack. Some form of mechanical draft would have enabled this defect to be overcome.

In a paper on the "Relative Steam Producing Value of Three Qualities of Coal," in the Street Railway Review, April, 1898, the writer made abstract of a test on the Duane street, New York, Edison station by Messrs. Arthur Baldasano and W. J. Beach, and concluded with this statement: "The results are interesting as showing the adaptability of the steam boiler to an enormous overload, though under undesirable efficiency, a circumstance which often occurs in central stations, where an accident may temporarily throw a higher duty on a lower rated boiler. An illustration of this occurred at the Edison station at Paterson, N. J. The entire boiler plant was buried in tons of coal, which fell, with the bunkers, upon the boilers. As soon as a sufficient amount of the débris could be cleared away, the entire plant was driven by one boiler, running at 113 per cent. overload. A temporary installation of the forced draft might at some emergency prove the salvation of a crippled station and a worried superintendent."

Engines have been improved by the adoption of compound and triple expansion engines, direct connection to generators, increased speed (in the case of simple engines), which diminishes cylinder condensation, improved regulation, and better design of condensers. The efficiency of the electrical generator has nearly reached a maximum. Such losses as are now met with are largely due to the physical properties of the only materials that can be used in making the apparatus, and will not be greatly diminished by any refinements of future design. The end in view in dynamo building is at present not so much an increased maximum efficiency as a higher economy under low and varying loads. An examination of the efficiency curve of a carefully designed generator will show that this requirement has been closely attained. Probably no kind of mechanical apparatus works with greater economy in the above respect. The large losses are in the steam apparatus—the boilers and engines. To avoid the roundabout generation of electrical energy necessitated by the use of such apparatus, and the consequent waste, attention has been turned to more direct methods of obtaining current.

Of late some attention has been devoted to the possibilities of the steam turbine. This, like the water wheel, is of a high degree of efficiency, and experiments have been made with various types of the machine, belted, geared or direct connected to generators. The excessively high speed attained (upward of 24,000 revolutions per minute), has prevented the application of steam turbines to electric power to any extent. This defect has been partially obviated by causing the steam to pass from one set of vanes to another set of larger area, thus constituting what is virtually a compound steam turbine.

More familiar to the practical man is the method of connecting a turbine water wheel to a generator. The turbine takes rank almost next to the electric generator in efficiency, and with a combined efficiency of, say, 80 per cent., this method of generation is about six times more economical from an efficiency standpoint than through the most economical of water-tube boilers and triple expansion engines.

Gas engines have been used in isolated plants, and the anomalous fact has often appeared that light produced by using gas in an engine to drive a dynamo may be cheaper per candle power than light from the gas direct. In one instance known to the writer, a combined gas and electric light company seriously considered the advisability of installing gas engines to run its dynamos, charging itself with the gas used in producing electricity for the more progressive consumer. One reason why the project was not carried into effect was that the management considered it poor economy to sell gas to itself at cost, say 50 cents per 1,000, when it could dispose of it to the public for $1.50 per 1,000.

Gas engines for electric railroads rated at 100 h. p. are in use at Danbury, Conn., and Lancaster, O.*

The use of storage batteries has been one of the greatest sources of economy. Storage cells are now a recognized necessity in the equipment of a European power station, and are coming rapidly into prominence in American practice. Not only do they increase the efficiency of the station as a whole, though their individual efficiency may be less than that of dynamo machines, but by taking care of the "peak of the load" they do away with necessity of units of aggregate capacity sufficient to handle the maximum load, and thus decrease the amount of investment necessary to fully equip a plant. Moreover, the storage battery adds an element of security and a guarantee of continuous operation from its ability to supply current during a temporary breakdown of apparatus, necessitating a change of machine, or possibly hurried repairs.

As supplied for central station work, batteries are grouped on skeleton frames which are placed in some vacant place, usually in a separate room from the engines and generators. Regulation of the voltage is effected by the "end cells," which are charged from "boosters"—small dynamos driven either by motors or from the main generator shaft.

In many railroad power stations, an extra generator is always kept ready, slowly turning on its shaft, for possible emergencies. The storage battery does away with this, and, indeed, removes the necessity for an extra generator. A recent example of the successful use of the battery system is at the station of the Imperial Electric Light, Heat and Power Co. of St. Louis.

Mention has been made of the extended application of batteries in European service. In Germany alone, in 1896, 200 central stations, of which 15 were combined railroad and power plants, were thus equipped. The experience of these stations justifies the estimate of a saving of 33⅓ per cent. in cost of generator equipment and of 20 to 50 per cent. in cost of coal, due to the use of storage batteries.† Of 139 continuous current stations in Germany in 1895, 101 were supplied with batteries.

Mr. Charles Blizard, in a lecture before the Henry Electric Club, April 26, 1898, made the statement: "Under the conditions which usually obtain, the first cost of a central station plant of about one-third battery and two-thirds generating apparatus will be less than were the entire capacity to be put down in dynamos, engines and boilers."

As showing the importance of regulation of the load—an advantage secured by batteries—the figures given by Mr. Ernst J. Berg before the American Institute of Electrical Engineers* are instructive. He estimates the average cost of an electrical horsepower to be $65.62 per year, where the load is uniform, and $148.40 a year where it is variable.

In this country, among the prominent stations using storage batteries are the Twelfth street station of the New York Edison Company, the Brooklyn Edison Co., the Hartford Electric Light Co., and the Imperial Electric Light, Heat and Power Co. of St. Louis, above mentioned.

The advantages enumerated for this system of installation may be recapitulated as follows:

(1) Smoothing down the "peak" of the station load, thus reducing necessary investment.

(2) Increasing the load on the generators during the low load period, thus enabling them to work at higher efficiency.

(3) Regulating the voltage of the lines.

(4) Furnishing a reserve force that may be called on in accidents or stoppages to continue an uninterrupted service.

Where cars are run by means of batteries carried on the cars, as is done to some extent in France and also on the Englewood & Chicago Electric Railroad in this country, considerations of the above nature regarding the load curve and provision for emergencies are of less account. The ordinary conditions of central station service do not apply, any more than they do to a compressed air plant. No wires or conductors are needed, and the power station bears no more relation to the continuity of the service than does any other supply department.

The heating and lighting of cars by electric current is a matter which closely affects the working of the power station. An unfortunate condition of this application of current is that the demand for both heat and light is apt to be heaviest (on most railroads) just at the time when the rolling load itself is at a maximum, namely, in the "rush" morning and evening hours. This adds to the height of the peak of the load, which is always an undesirable point for increased output to take place.

The lighting of cars by electricity is practically universal, two circuits of five 100-volt lamps being usually placed in series between the wire and the rail. Recently electric headlights have come into vogue. Where a low speed is maintained, the latter need be of no more than 25 candle power, just sufficient to illuminate the switches for the conductor. Where a speed greater than six or eight miles per hour is adopted, a more powerful light must be used, and lamps up to 100 candle power have been adopted.

For electric heating the circuits are usually connected as a shunt across the motor terminals, and the current passes through a variable resistance which gives a maximum of 10 amperes in the coils. On a road running say, 1,000 cars, a generator equipment of at least 500 k. w. would be necessary to care for this heating, and the extra investment required is therefore considerable. In operation, most railroads have found the method cheaper than stoves, as no attendance and little repair is required.

A new phase for the electric railroad has been opened by the perfection of methods of long distance transmission. The power house may in such cases contain only alternate current generators and current may be supplied to various sub-stations several miles away. The Lewiston, Brunswick & Bath (Me.) Railway, now building, will be an example of this type, transmission being in three directions, over distances aggregating 30 miles. A novel form of generator, designed by the Westinghouse Electric & Mfg. Co., is here used, which produces both alternate and direct current simultaneously, the former being transmitted to the various sub-stations, and the latter being supplied directly to a local line. The generator is essentially a direct current machine, with the number of poles and speed proportioned for the frequency of alternation required, and provided with suitable collector rings connected to the proper points of the armature winding for taking alternating current from the same winding. The direct current voltage corresponds to the maximum alternating current voltage; while the mean alternating current voltage, as indicated by a voltmeter, is about .71 of the direct current voltage for two-phase machines and about .61 of the latter for three-phase machines. These dynamos are provided with both shunt and series field windings, the shunt winding being always connected across the direct current brushes. When the machine is run to produce direct current alone, the main current passes through the series winding as usual. When working as an alternating current generator the regulation is effected by means of the rotary transformer at the sub-station by having the direct current pass through the series winding. This necessitates compounding the rotary. The e. m. f. of the generator, as well as that

*See article by the writer on "Variation in Boiler Efficiency," in Power, August, 1898.

*See Railroad Gazette, May 20, 1898.
†Trans. A. I. E. E., fifteen, 5.

* Trans. A. I. E. E., loc. cit.

of the rotary, is thus increased, giving an increased direct current e. m. f. The generators are wound to over-compound about 10 per cent. when used as direct current machines. When used to give both currents at the same time they will not, of course, regulate for both loads.

The alternating current which is to be transmitted from the generator in a plant like the one mentioned, is first carried to the transformer house, where it is raised to a high voltage for economical transmission, then carried to the sub-stations, wherever located, and "stepped down" by lowering transformers. This low potential alternating current supplied to a rotary transformer is converted into direct current for the lines to be operated from the respective sub-stations.

In a large city, it is often found cheaper from the standpoint of the cost of copper conductors, to have several power stations rather than a single one. The expense of smaller units and scattered labor is against this plan. A transmission system like the one described above concentrates all the boilers and engines in one building, and permits the cheapest possible system of distribution. Separate machines are used almost universally for alternating and direct current. The expense of rotary transformers is to be balanced against duplicate steam plants where a number of small stations are in use, or large expense for copper and a loss in heating the conductors as against a single station supplying the whole of a large system.

In all "sub-station" installations the regulation of the voltage of the various lines must be at their respective sub-stations, as the voltage of the generator in the main station varies with the power factor of the alternating circuit it supplies, which latter depends upon the condition of the load.

Improvements in transformer construction have had much to do with the success of power transmission for railroads. All the large transformers are now self cooling and oil insulated, and are of high efficiency, even at low percentages of loads.

Any discussion of line losses and expense of transmission must take into account the methods of measurement of current supplied to cars. Until recently such measurements have been made only in accurate tests. The General Electric Company has now produced a recording wattmeter for car service, which may prove the basis of some interesting data.

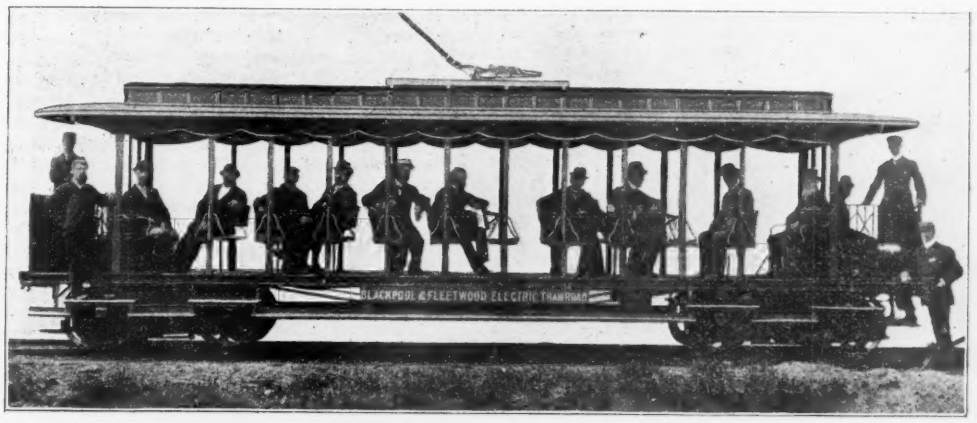
[To be continued.]

English Electric Railroads.—I.

Within the past few weeks English electrical engineers have added more miles of electric street railroads than was the case during the whole of the preceding twelve months. The coming months promise to keep up this excellent record, and it is probable that there will be a steady opening of new electric lines, or of converted horse lines, until England is provided with a good rapid transit service by electric cars. The fact that such a satisfactory state of things has not come to pass before the year 1898, when America seems to have reached it years ago, has been a matter of general comment among European electrical men. We need not here discuss the many causes for delay. Legislation and its red tape, municipal opposition, and perhaps want of enterprise may be placed among the primary causes.

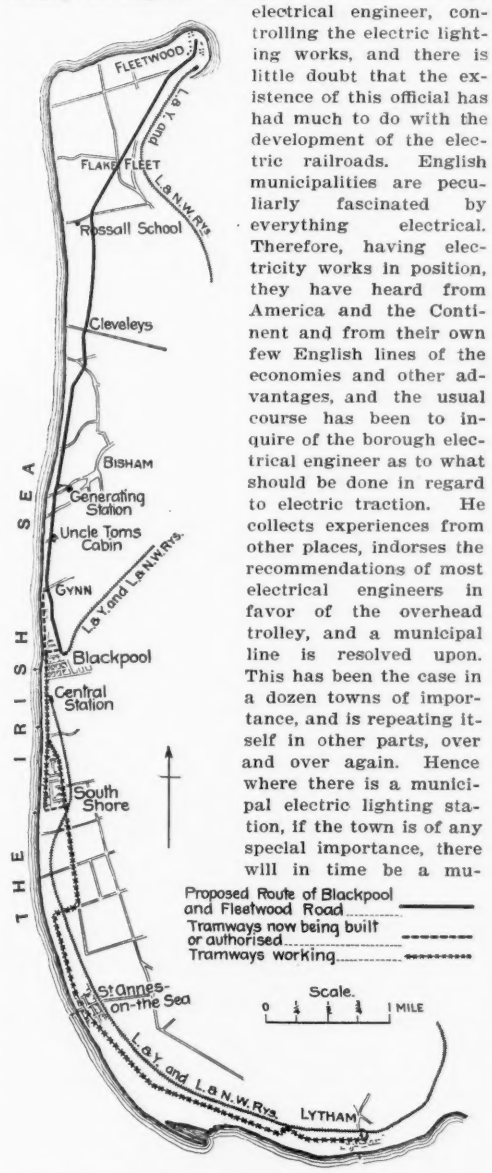
But now that the country has actually awoke to the advantages attending the use of electric traction, to discuss those matters would be of no practical use. What has led to the awakening is of more moment. Only those Americans who have actually taken part in the promotion of electric street railroad undertakings in England or Ireland can fully appreciate the extent of the difficulties placed in the way of the promoter. The great length of time occupied in securing Parliamentary powers for the construction of lines under the Tramways Act, and the interference of the local governing bodies who control all matters relating to the roadways, led to widespread dissatisfaction and gave rise to the introduction of the Light Railways Act a year or so ago. Under this act it was arranged that promoters of light steam, cable, electric or other railroad lines could file their applications for powers with the Light Railways Commissioners, who would hold public official inquiries in the localities through which the roads run. At these inquiries evidence would be presented by parties who chose to appear either in support of or against the proposal. After considering the evidence, the Commissioners would decide whether the line could be built. By this means promotion expenses were lessened, and much time and trouble saved. Needless to say such facilities have been taken advantage of very largely, and already as many as 121 applications for orders have been laid before the Commissioners, such applications representing 1,305 miles, and £7,500,000 capital outlay. The first line promoted under the act has been built, and it is important to mention in this connection that the promotion expenses have only amounted to £150, whereas if Parliamentary powers for building this railroad had been sought they would have necessitated an expenditure of something like £1,000—nearly seven times as much. It is likely that many electric tramway schemes will in the future be brought out as light railroads.

An important point in regard to the official inquiries is the fact that the Commissioners would have power to override the opposition of the municipal authorities, if they appeared to be unreasonable or unnecessarily severe upon the promoters. Where schemes have been deadly opposed, tooth and nail, by the localities, the Commissioners have in most cases not seen much wisdom in interfering with that view, but in some parts of the country they have shown that the municipalities are not going to have it all their own way.



Motor Car on Blackpool & Fleetwood Electric Tramway.

Nearly all English municipalities have a borough electrical engineer, controlling the electric lighting works, and there is little doubt that the existence of this official has had much to do with the development of the electric railroads. English municipalities are peculiarly fascinated by everything electrical. Therefore, having electricity works in position, they have heard from America and the Continent and from their own few English lines of the economies and other advantages, and the usual course has been to inquire of the borough electrical engineer as to what should be done in regard to electric traction. He collects experiences from other places, indorses the recommendations of most electrical engineers in favor of the overhead trolley, and a municipal line is resolved upon. This has been the case in a dozen towns of importance, and is repeating itself in other parts, over and over again. Hence where there is a municipal electric lighting station, if the town is of any special importance, there will in time be a municipal electric tramway also This remark applies to most places. Where the tramway powers are now in the possession of companies, there is a desire to buy them up for the municipality either at once or as soon as the companies' leases have expired. The municipalization movement is leading to the equipment of many municipal lines, but it is doing harm to the schemes of companies who are desirous of laying large systems connecting several important towns which are, of course, in the hands of a number of Town Councils. It is hardly to be supposed that one system of 20 or 30 miles could be successfully worked when half a dozen municipalities had each a finger in the pie and were continually at loggerheads. These are the undertakings which are really very much needed, and it is to be hoped that the municipalities learn to deal a little more reasonably with the promoters of such lines than has been the case up to the present. Several such lines are hanging fire.



Electric Roads near Blackpool, England, on the Irish Sea

A matter in which the English borough electrical engineer will have the sympathy of the American electric railroad man is in regard to the ordering of plant and apparatus. He knows from the experience of existing lines that none is so well able to equip lines with electric power as the American houses already pitched in London, but he has, in specifying plant to be tendered for, or in accepting tenders, to be confronted with the fact that the whole country will want to know why he needs to go to America for his equipment. Few English lines are absolutely English in all points; only about one system among those recently constructed can make that boast. The said engineer will not be looked upon with sincere affection by the English electrical manufacturer or contractor. This feeling is not so great as it has been, probably for the reason that manufacturers are bowing to the inevitable, and also because English firms have recently secured some good traction contracts, so that they feel they can afford to allow a number to go to Anglo-American houses who are making such a strong bid in all parts of the country.

What is the system of electric traction to be employed in London? That is a question upon everybody's lips when these matters are thought about. London has no electric trams whatever at present, because the trolley the authorities will not have, and the accumulator they cannot. Sheffield, Birmingham, and Glasgow dislike the idea of the trolley, but two of the places are like Manchester, Liverpool and other towns, equipping electric trolley lines by way of experiment. But for London! The London County Council will have nothing to do with the trolley; it will not even approve of it for the suburban districts. It has declared this over and over again. Yet the Council acknowledges that it must soon change its systems from horses to mechanical traction. In January next over 70 miles of London trams will be worked by the Council, which has municipalized them, and it has now formed a Special Tramways Department and will appoint a man of knowledge in such matters to take command. It favors electric traction, but unless the accumulator is better able than it is at present, the Council may long go on with horses, unless its views materially alter. There seems no earthly reason why the trolley should not be used in London suburbs, if it can be used for Sheffield, Manchester, Liverpool and Glasgow.

We propose following these statements on the general situation with some notes on a few of the English roads, especially those which have been completed within the past few weeks. Up to the present the opening of new lines has caused quite a stir in the English electrical world, as they have been so few and far between, and all descriptive detail has been followed with interest by engineers, both electrical and mechanical. The lines which we propose briefly to describe possess important features for English practice as compared with previous work there. We venture also to remark that the lines upon which these systems have been equipped may be taken as a good index to future practice in England.

The trolley lines of the city of Bristol, when opened, had a power station equipped with three Willans center-valve compound non-condensing engines, giving 135 i. h. p. each, at 380 revolutions, with a steam pressure of 160 lbs. The fly-wheels were 3 ft. 8 in. in diameter and grooved to take 1¼-in. Egyptian cotton ropes for driving the dynamos. But the Tramway Company's experience with this plant, it will be remembered, led to the abolition of the rope-driven machines and the introduction of four 250 h. p. compound Macintosh & Seymour engines, direct coupled to four 150 k. w. generators of the six-pole type. The increased power was required on account of an extension to the line. One of our illustrations shows the Bristol power station with the new direct coupled plant in position.

Some other views are given, showing the lines of the Dublin Company at Clontarf. This section was only a few miles, but the following figures show what an

advantage has been reaped by the directors and shareholders through the introduction of electric traction. As these figures will be doubtless much quoted among English tramway men, we have thought some photographs of the system would be interesting. We have already given a few details of the plant.

Period commencing March 21, and ending June 30:

	Passengers.	Average Fare.	Receipts.
Horse (year 1897).....	697,928	1.71 pence	£4,934
Electricity (year 1898)..1,246,020		1.30 pence	6,775

The working expenses for horse traction were 71.76 per cent. of the gross receipts, and for electric traction 47.09 per cent. English lines have not brought forth many instances of such satisfactory figures in favor of electric traction. Hence their present importance.

The new lines recently opened are from Blackpool to Fleetwood, Middlesbrough and Stockton, Kidderminster and Stourport (recently described in the Railroad Gazette), Halifax and Bradford, all being trolley systems, two municipal and two private.

Blackpool and Fleetwood.

The accompanying map shows the route of this line along the coast, overlooking the Irish Sea. The line is divided into three sections; a tramway within the borough of Blackpool, a tramroad or light railroad, with private way, from the Blackpool Borough boundary to Fleetwood, and a second tramway within the township of Fleetwood. The total length is about 16 miles. The power house is about two miles from Blackpool. The gage is 4 ft. 8½ in., and the ruling gradient 1 in 40. The tramway sections are laid with grooved girder rails, but the closed way section has Vignolles rails laid on cross sleepers. The track is double throughout, with the exception of the tramway in Blackpool, which is only single track, provided at intervals with passing places. The rails at the Fleetwood end weigh 81 lbs. per yard, and the Blackpool rails 98 lbs. per yard, electrically connected. Two copper bonds of the Daniel type are used at each joint. The tramroad rails weigh 56 lbs. per yard, and they are bonded with plastic bonds, placed between the fish plates and rails, and consisting of a spring washer amalgamated with a mercury alloy, which is contained in a cork receptacle. To fix the bond the fishplate is removed and part of the rail and plate are cleaned and amalgamated. The bond is then placed on the clean surface and the fish plate replaced and screwed up. The entire electrical equipment was done by Messrs. Mather & Platt, Ltd., of Manchester, who prepared specifications and designs, which were adopted by the Blackpool & Fleetwood Tramroad Co.

A double trolley wire has been erected throughout the entire length, being supported in Fleetwood by steel poles fixed in the center of the road and fitted with double arms having brass ears insulated from the pole arm by special insulators. The poles are fitted with ornamental scroll work. On the private tramroad the poles are also fixed in the center of the track and are plain and substantial. In Blackpool side arm poles are used, except at one or two places, where the width of the road necessitated span wires. A feature in the overhead wire is the entire absence of frogs. This has been done by bringing the trolley wires closer together over a crossing, so that when the car is half over, the trolley is removed from one wire to the other without stopping the car. At every half mile the wire is broken by a section insulator and taken down to a section box fitted with four wedge switches, which enable any section of the line to be disconnected, if required.

There are four underground lead covered and armored feeders which are taken into neat cast iron feeder boxes, from which current is fed to the line through wedge switches. The generating station buildings comprise engine house, boiler house and car shed. There are three 30 x 8 ft. Lancashire boilers with an economizer and two direct steam driven feed pumps supplying water to the boilers from the hot well. The boilers supply steam at 120 lbs. per sq. in. to 4 open marine-type vertical compound engines with cylinders 12 and 24 in. diameter and 16 in. stroke, and running at 180 revolutions per minute. Upon the same bedplate and direct coupled to each engine is a Mather & Platt multipolar dynamo, with a slot-wound armature capable of a continuous output of 120 k. w. at 500 volts. The generator dynamos have an efficiency of 93 per cent., and when run continuously on full load the rise of temperature of no part of the armature exceeds 25° C. The steam and exhaust pipes are carried underneath the floor of the engine house, in the basement, so that there is ready access to the pipes and engine foundations. The main steam pipe is of steel and is fitted with a separator, as is also the branch to each engine, thus insuring dry steam passing to the cylinders. Ejector condensers are provided, the condensing water being obtained from a storage reservoir at the back of the engine house, being pumped up by circulating pumps driven by Mather & Platt single-acting enclosed high-speed engines, the pumps being coupled direct. The switchboard has five substantial slate panels, two for the dynamos, two for the feeders and one for the testing instruments and station switches.

Boosters are installed, by means of which the pressure at the feeding point on the line is automatically kept constant. There are three such boosters, each consisting of a four-pole motor connected direct to a four-pole generator on the same bedplate. The motor is connected to the bus bars, and the speed may be varied to suit the voltage required by means of a resistance inserted in the shunt windings. The booster also enables the charging of accumulators independently of the line.

The engine room adjoins the car shed, and is provided with a five-ton traveling crane (overhead), which is common to both. One end of the car shed is fitted with various machine tools for repairs, etc., driven from a countershaft by an 8 b. h. p. Manchester motor. There is room in the car sheds for twelve cars. The whole buildings are lighted with incandescent lamps, all controlled from one central distribution board. There are at present provided and on order 16 open motor cars, eight closed motor cars, and three trailer cars. The motor cars are 34 ft. 6 in. long, mounted on two bogie trucks with 28-in. wheels, and were made by Messrs. Milnes & Co., of Birkenhead. Each car will carry 48 passengers, and when loaded weighs about 12 tons. Each car has two iron-clad motors, rated to give about 35 h. p. each. They are sufficient to work the cars at a speed of 25 miles per hour. English regulations only allow a maximum along the ordinary public streets, though there is a growing feeling in favor of this being increased to 10 or 12 miles an hour, and in at least one town approval to a rate higher than the ordinary has been given.

This Blackpool line runs, as stated, upon a private way for a good distance, so that a good speed may be employed, hence the necessity for power for 25 miles an hour. Of course, this is a point of considerable importance in suburban lines, a point which will soon be better appreciated by the traveling public when a greater number of the proposed new lines are working. It greatly enhances the attractiveness of the line and allows of much more effective work being obtained from a given amount of rolling stock. The motor is geared to the axle through a single reduction cut gear enclosed in an oil bath, the ratio of reduction being about 4 to 1. Each car has two series parallel controllers, and the usual automatic devices for breaking the circuit if too much current is taken. There being no outside seats, the trolley pole is of the ordinary swivel type.

The cars are lighted by incandescent lamps. In each of the two accumulator stations, one of which is at Blackpool and the other at Fleetwood, there are 250 chloride cells. Each battery will give an output of 300 ampere hours at a voltage of 500. These stations are for steadying the voltage on the line and providing for sudden demands for current, and also for providing power independently of the generating plant for early morning or late night trains. The two stations will together provide for 100 car miles, or six double journeys. The cells may be connected in parallel with the overhead wire, or the feeders alone may be directly connected to the line, or the cells disconnected from the line and coupled direct to the feeder, which would be the case when charging the accumulators. Each switchboard is fitted with recording voltmeter, measuring the drop in rails, and with Aron ampere-hour meters and watt hour meters to register the charge and discharge of the cells. It is intended to use the accumulators for early and late running, and for winter running, thus enabling the generating plant to run at a fairly constant load.

[To be continued.]

American Association for the Advancement of Science—Fiftieth Meeting.

The second Boston meeting of the American Association for the Advancement of Science, held at the Massachusetts Institute of Technology last week, was carried out according to the programme published in the Railroad Gazette July 29, 1898, p. 547. Over 900 members registered, besides members of affiliated societies attending the meetings, making the aggregate of nearly 1,100. Every section was crowded with papers, making Tuesday and Thursday busy days; the other days after the opening having been much broken up by excursions and entertainments. Every man appointed to speak at the opening of the different sections was there, and the President and all the Vice-Presidents read their addresses, except Prof. M. E. Cooley of Section D, who is still absent on duty in the navy. His place was taken by Prof. R. H. Richards, of the Massachusetts Institute of Technology, who gave an address on ore-dressing, illustrated by stereopticon.

The papers in Section D were probably more interesting to engineers than those read in this section for many years. Prof. Edward Orton, the veteran geologist of Ohio, was elected President; Prof. John I. Flather, of the University of Minnesota, Vice-President of Section D. The next meeting will be held at Columbus, O., beginning Aug. 21, 1899. Below are given abstracts of many of the papers before Section D.

A Dynamo for Integrating the Work Done in Drawing a Train.—By Prof. Thomas Gray, Terre Haute, Ind.

This is a spring dynamometer provided with attachments for integrating the total work done during any particular run, and also with autographic appliances for recording the pull at any instant during the run. The peculiarity of the spring part is that the springs are held in sufficient compression, by means of a strong steel frame, to allow the pull to be applied to the middle of the spring system. In this way one part of the spring is relieved of compression, while the other has its compression increased by the pull. The object is to provide for definiteness of zero and constancy of scale from the beginning of the pull. The pull is applied to one end of the steel frame and to a stiff plate introduced into the middle of the spring system. The middle plate may be called the movable plate. This plate carries, by means of an arm attached to it, the integrating mechanism. This consists of a revolution counter provided with a friction wheel intended to roll on the surface of a flat disk, which turns with a speed proportional to that of the car. When the pull is zero the friction wheel is adjusted so that rotating the disk does not turn it. Afterward the rate of revolution of the friction wheel is proportional to the product of the pull on the train and the speed of the car. When a record of the pull at any instant is desired, the arm which carries the counting mechanism or a separate one is provided with a pen, which is arranged to write on a bunch of paper fed forward by the car.

Methods of Determining the Frequency of Alternating Currents.—By Carl Kinsley, St. Louis, Mo.

The accurate determination of the frequency is essential for the correct computation of the relations between electro-motive force, current, self-induction and capacity. Since the periodicity must usually be squared, it is essential that the determination be made quickly and with but little error.

Dr. John Hopkinson was the first to use a stretched steel wire worked by an electro-magnet, and when the condition of maximum resonance was found, the periodicity was calculated from the constants of the wire and its tension.

Dr. Campbell (Phil. Mag. Aug. '96), proposed the use of an iron rod which was thrown in resonance in the same way. From the constants of the rod and its length, the periodicity was computed. The rod he found could be more easily used than the wire.

Another method capable of great accuracy and easy manipulation requires the use of a telephone in the alternating current circuit and a resonance tube by means of which the periodicity may be calculated from equations, or it can be gathered from tables already computed. (Kinsley, Phil. Mag. April, 1898.)

A very satisfactory method will be one which includes the use of a metal strip as the primary resonator whose periodicity may be changed by means of an added weight. An electro-magnet may be used as in the first two cases to set this into vibration. The periodicity can be calculated from the constants of the vibrator (Lord Raleigh, "Theory of Sound"), or a complete colibration can be made by two determinations. It will usually be more satisfactory to standardize by actually determining the periodicity of two adjustments of the resonator. The equation to be used for that purpose is $t^2 = Dl^3 M + Kr^4$ where t = time of one complete oscillation, l = distance of the sliding weight from the support, M = Mass of the slider, r = length of the vibrating rod, D and K are the constants of this particular apparatus which may be either calculated or obtained by experiment.

The condition of resonance is readily obtained and the determination may be made with as great accuracy as may be desired.

Energy Received from the Sun.—By Professor L. G. Carpenter, Fort Collins, Col.

It is well known that the sunshine on our Western plains is much greater in amount than that received by the East. For nearly ten years the author has taken observations on the intensity of the energy received from the sun (using the Arago-Davy conjugate thermometers), and also observations on the amount of sunshine. The observations show an intensity of from ½ to 1.4 h. p. per square yard from 8 a. m. on sunny days.

High Speed Influence Machines.—By Charles F. Warner, Cambridge, Mass.

The special improvements referred to in the paper are effected by special insulation, improved contacts, careful balancing of revolving parts, and changes in the driving mechanism. The inconvenience from reversals is largely overcome by a newly devised commutator to provide effectually for discharges of great frequency. An attempt has been made to secure high speed with ease and safety. Two forms have resulted. One, designed for compactness, has ball bearings of the highest grade; the other, of larger dimensions, has gear-metal bearings. The speed attained exceeds 4,000 revolutions per minute, which is the highest rate which the author has been able to find recorded for influence machines. The resulting discharges are of great frequency and, for certain purposes, are remarkable efficient.

Lamp-Hours Per Day Available for Electric Lighting from a Storage Battery Plant Driven by a Twelve-Foot Air-Motor.—By Professor C. L. Crandall, Ithaca, N. Y.

In estimating the cost of working a small power

plant, the cost of attendance may form a large percentage of the total. This expense in contrast to the low cost of maintenance, enables the windmill to compete with other prime movers for small units. The uncertainty in the supply is not very serious for pumping, where storage can be provided, and for many other purposes. Its effect is to increase the capacity of mill, and hence the interest and depreciation charge, for a given service. This is especially the case for electric lighting where the cost for storage by a storage battery forms an important part of the total expense and increases rapidly with the storage capacity.

The following estimate of the daily lamp hours available for lighting was made with a ¾-k. w. dynamo and a 12-ft. aermotor.

The power of the mill for different wind velocities is taken from tests of a similar mill published by E. C. Murphy in the Engineering News, Aug. 19, 1897. The efficiency of the dynamo, and the current of given voltage required for each lamp, are obtained from the tests at the Physical Laboratory of Cornell University. The efficiency of the storage battery is estimated. The wind velocity is taken from the records of the New York State Weather Bureau at Ithaca for a year, beginning July 1, 1897.

From the power of the mill and the efficiency of the dynamo and storage battery, the curve of ampere hours at the lamps for a fixed voltage is drawn with wind velocity as abscissa.

With this curve and the wind record, the ampere hours per day at the lamp are plotted as ordinates, with time as abscissa. With low winds the curve approaches a horizontal direction indicating a minimum supply. Tangents are drawn at these points and extended to the left at angles corresponding to different lamp hours per day. The greatest ordinate upward from a tangent to the curve will give the storage capacity required to meet the assumed daily consumption.

The Evaporation and Seepage from Reservoirs.—By Professor L. G. Carpenter, Fort Collins, Col.

From two seasons' measurements on a series of reservoirs in Colorado, the author determines that in those cases the loss from seepage is much less than from evaporation, amounting to about 2 ft. in depth per annum. A determination covering 11 years showed that the loss due to evaporation was 41 in. from his standard tank. From the reservoirs under observation, several years' record indicates a loss of about 60 in. from evaporation. The author reports the results of a series of measurements made on a number of rivers in Colorado. While gains from oozing are the rule, there are sections on nearly all of these streams where losses are found year after year, and sometimes to a considerable extent.

The Rio Grande loses from 70 to 100 cu. ft. per second in a distance of 10 miles. On the other streams the loss is less. In the case of the Platte there is some reason to think that a portion of the water reappears. In the case of the Rio Grande, neither the water thus disappearing from the river nor the water sinking in the numerous small streams reappears within Colorado.

New Passenger Cars of the Chicago Great Western.

The Chicago Great Western has recently put in service some new passenger cars, which are interesting on account of the radical departure which has been made in the design of the interiors. Of these we illustrate the chair cars, which were built by the Barney & Smith Car Co., of Dayton, O., and the buffet cars, which were built by the Pullman Co., Chicago. The cars were designed, however, by Mr. Tracy Lyon, Master Mechanic of the road, and detail drawings were furnished to the builders; Mr. Stern, an architect, of St. Paul, assisted in the design of the interior decorations of the buffet cars.

Nothing about the constructive features of the cars differs much from the best accepted practice. All are 63 ft. long over sills, have six-wheel trucks with 36-in. steel-tired wheels, Pullman wide vestibules, Standard steel platforms and Westinghouse air brakes for all wheels. Pintsch gas is used for lighting.

The chair cars, as shown in Fig. 1, are distinctive on account of the simplicity of the interior design and finish, and the absence of "ginger-bread work." They represent, perhaps, the extreme in the direction of elegant simplicity. It will be seen that there is neither carving nor moulding in the car, and it is needless to add that such plain woodwork is easily kept clean. The finish is mahogany, all the surfaces being perfectly plain with a relief only of a narrow strip of white wood inlaid about the windows and panels in the clear story. This idea is consistently carried out in the bulkheads at the ends, and throughout the car. The panels in the bulkheads and in the roof and the head lining, are of a very rough canvas painted a dull blue-green without relief and intended to be without decoration; the spots on this material shown in the engraving were contributed by the painter and were not intended.

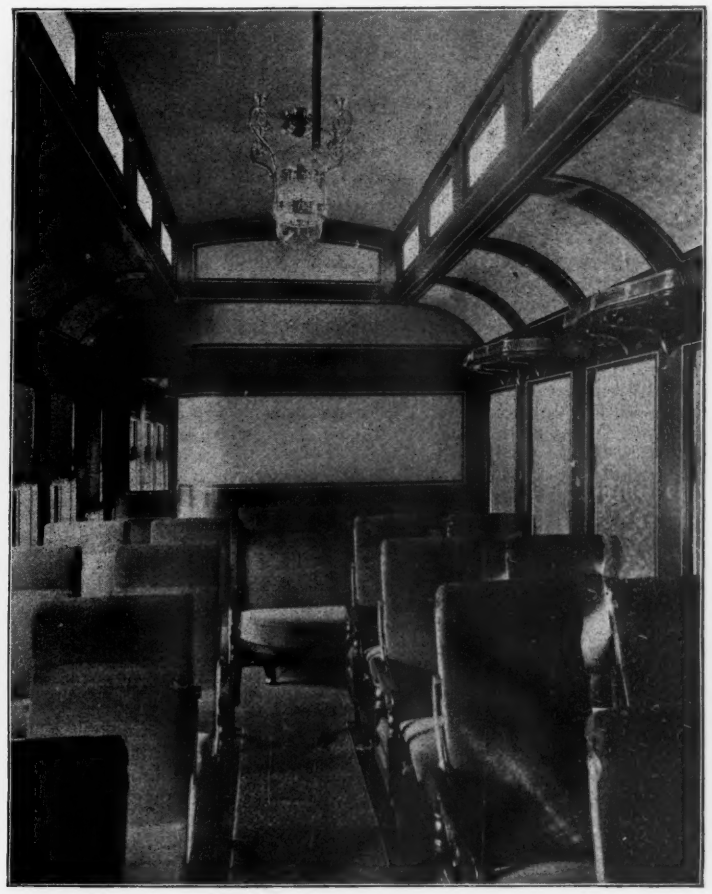
The buffet cars, as shown by Figs. 2 and 3, are even more original in interior design and arrangement, the smoking room of the car looking more like a room in a house than part of a railroad train. The two ends of the smoking room are alike, each having at one side a big corner seat, over one end of which, in the side of the car, is a leaded-glass window similar to those in the center of the apartment, between the cabinets. By means of these leaded-glass windows the monotony of the usual long row of windows of the same size is avoided. There are on each side two groups, of three windows each, besides the leaded-glass windows and one larger window at each end. In the center of the room is a table on which is a standing-lamp, and there are also small tables at each end so that it is possible for a number of passengers to get together almost anywhere; this cannot be conveniently done in the parlor smoking cars, arranged in the usual fashion.

The original design of the roof also helps to give this car the appearance of a room. There is no cove under the deck, the latter extending out straight from the wall, which is treated without pilasters. Above this is a complete dome springing from the ends of the room as well as from the sides, and without lunettes for the deck sash; the latter are covered by brass grilles, leaving the line of the dome unbroken. Besides the lamps in the center of the ceiling, there are four lamps in small domes, one in each corner of the apartment, so that the lighting is very effective. The car is finished in padouk and treated in a modified Empire style with a good deal of brass. The chairs are upholstered in light-green leather.

The smoking room is 32 ft. long. The rest of the car has 12 ordinary seats, six on each side.

The compartment on the right, as shown in the plan, is used for second-class passengers. It is necessary to sometimes carry immigrants and section men on this train, and this place was fixed up for them. The door between this room and the buffet is kept locked, so that such passengers cannot wander back into the other cars.

Buffet Car.



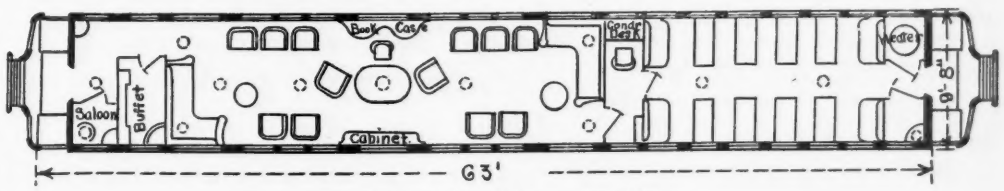
Chair Car.

New Passenger Cars of the Chicago Great Western.

Designed by MR. TRACY LYON, *Master Mechanic.*

The Snoqualmie Falls Transmission Plant.

The accompanying map shows by the broken line the transmission line of the electrical generating

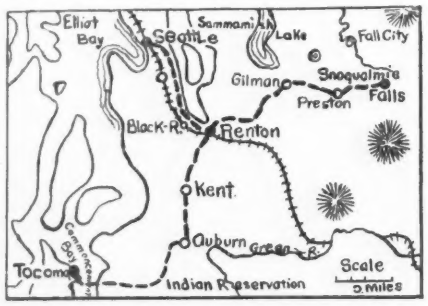


Plan of Buffet Car—Chicago Great Western.

plant at Snoqualmie Falls, Washington, the details of which have been completed.

The work of building this plant with the transmission line began early last spring. The plans provided for a dam on the Snoqualmie River, 450 ft. long, 15 ft. wide at the base, and 8 ft. wide at the top, to be made of solid concrete. In the center of this dam will be a bear trap dam for the escape of flood water; the intake water will be taken through two 7-ft. steel pipes 250 ft. long, placed vertically in a cut made for the pipes in the solid rock. The water

wheels and generators will be in a cave at the foot of the shaft. A tunnel is being driven below the falls to serve as a tail race. The present plans provide for four 1,500 k. w. 1,000-volt Westinghouse, 3-phase generators, designed to run at 7,200 alternations a minute. These will be directly connected to water wheels running 1,300 revolutions. The current will be carried at the above named voltage to the top of the shaft, where the house for the switchboard and step-up transformer will be built. All the generators, transformers, exciters and other electrical apparatus will be supplied by the Westinghouse Electric & Manufacturing Company.



Transmission Line of the Snoqualmie Falls Plant.

The voltage over the transmission line will be 29,000 at the falls and 25,000 at points of delivery. A comparison of this voltage with others of the Westinghouse installations shows that this is the highest voltage at the generating point that has been attempted. For the first 19½ miles to Renton, the transmission line will run over the same right of way as shown in the map. At Renton facilities will be provided for switching the Seattle current into the Tacoma circuit and vice versa. From the Falls to Seattle, the length of the pole line will be about 30 miles and to Tacoma, 40 miles.

One of the most interesting features in connection with the work will be the use of aluminum wire for the transmission line. The Chief Engineer states that the company has succeeded in making contracts for a supply of aluminum wire at prices that will make it cheaper than copper. The metal which will be used will contain 99.3 per cent. of aluminum, and not more than .25 per cent. of iron and .30 per cent. of silicon. About 150,000 lbs. will be required by the company.

The line will, for the most part, be on country roads, but in some cases a private right of way has been secured. The poles, which will carry wooden pins and cross arms, will carry six wires each, and will be placed about 125 ft. apart. The Redland type of insulators will support the aluminum conductor wires.

It is stated in the last issue of the Electrical Engineer that the flow of the Snoqualmie River is such that 30,000 h. p. will be available at extreme low water. About 12,000 h. p. will be generated at the Falls if the present plans are carried out. It is believed that within a few months the company will be able to supply 4,000 k. w. at Seattle, and 2,000 k. w. at Tacoma.

Mr. Wm. T. Baker and Mr. Thomas T. Johnson, the latter a well known Chicago engineer, are associated in the enterprise. Mr. Chas. T. Baker of Seattle is President and Manager of the company, and Mr. J. J. Reynolds, formerly Chief Engineer of the Chicago Terminal Railroad Company, will superintend the construction.

Iron Signal Posts on the C., M. & St. P.

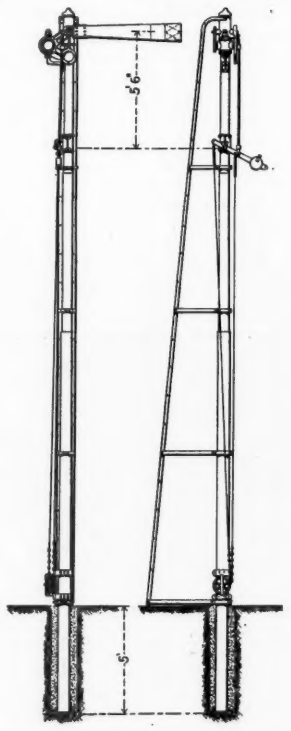
The use of more durable materials in structures which it has long been customary to make of wood is a prominent feature of the general advance in railroad economy which has taken place during recent years; and the signal department seems disposed to keep abreast of the other departments. In foundations and other structures connected with signals the life of wood has, in many cases, been very short, and as these parts have had to be renewed on account of decay other devices have been developed. One of the first to give up wooden posts was Mr. H. D. Miles, Signal Engineer of the Michigan Central, who read a paper on this subject before the Railway Signaling Club shortly after the club was organized, giving the results of his experience. While the roads have been rather slow, they are now favoring durable structures to such an extent that the signal companies are prepared to furnish this class of work, and they are looking into the subject with the idea of improving their standards.

The iron poles here shown are those adopted by the Chicago, Milwaukee & St. Paul as standard. They were designed by Mr. W. H. Elliott, Signal Engineer of that road.

The drawings show a very simple design. Changes in connections can easily be made in the field. In place of the usual 10 in. x 10 in. wooden pole, a pole made of 4-in., 5-in. and 6-in. pipe, having swaged joints 18 in. long, is used for the mast. Such a post 32 ft. long weighs but 550 lbs., and one 38 ft. 660 lbs. The fittings, on which there is little machine work, are made to clamp the pole, instead of screwing to it. The cap casting, to which the ladder is fastened, and through which the shaft for the arm plates is carried, is slipped over the end of pole and the joint is filled with lead and caulked. This is an efficient yet easily made fastening.

With this easy method of fastening the fittings the cost of the 32-ft. iron pole is brought down to about what the same pole made of wood will cost; for, while the pole itself costs a third more than the wood, and the fittings for the iron pole are heavier, there is so little skilled labor required that the cost of fitting up is much less. For the 38-ft. pole complete, the cost is about $4, or 10 per cent., less than where wood is used. Therefore, the first cost, as well as economy and maintenance, are in favor of the use of the iron pipe.

The poles, after being set in the ground, have concrete packed in around the bottom, sufficient to make a block about 12 in. square, to give a stable base and support the pole without looseness in the ground. That this is large enough to hold a pole firmly in place has been clearly proved, the large number now in service having given no trouble in this respect. To prevent rusting at the top of the



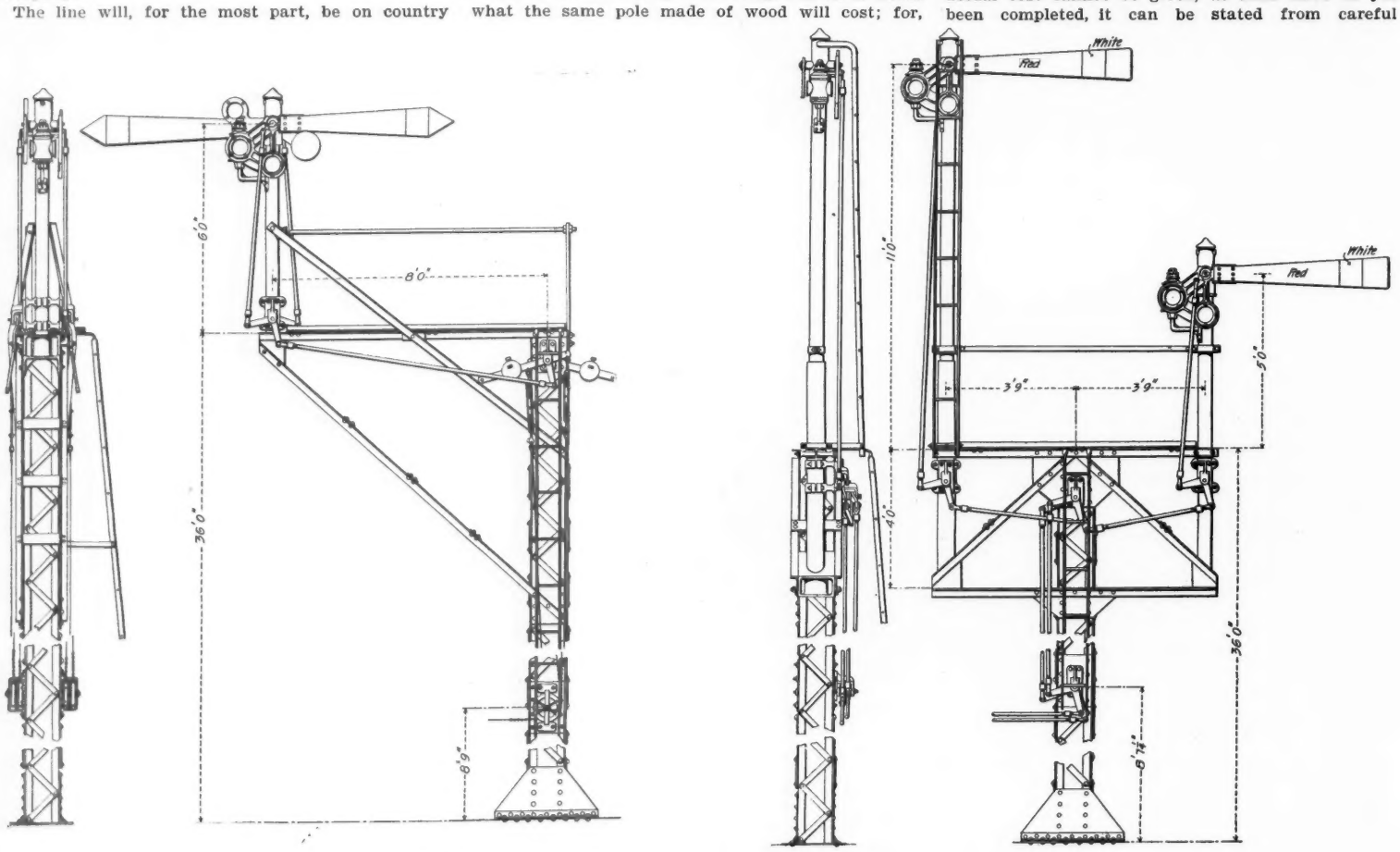
Standard Post, C., M. & St. P. Ry.

cement, the concrete is brought above the ground, wherever possible, to give a good slope and cause the water to run off. When erected, the poles present a remarkably fine appearance. On the Milwaukee road they are painted white, the same as the wooden poles, and seem to be as easily seen.

In the design of the bracket and offset poles, there is less departure from the common practice, as such work has generally been made of iron. Although the actual cost cannot be given, as none have as yet been completed, it can be stated from careful estimates that their cost will be but little more than that of wood.

The built up post and cross arms only, such as can be contracted for with bridge shops, weigh for the bracket pole 2,000 lbs., and for the offset pole 1,990 lbs., which at 2.2 cents per lb. gives cost of pole, without 4-in. pipe or fittings, as $44 and $43.78 respectively.

As will be seen by an examination of the cut, the post is built up of four 2½ in. x 2½ in. x ⅜ in. angles, the bracing being put on the outside and the post



Standard Iron Signal Posts—Chicago, Milwaukee & St. Paul Railway

made straight so as to use bracing strips of the same length.

For economy in construction none of the cross arms or braces, with the exception of the two braces on the off set pole, are bent, the castings to hold the pipe posts being made wide enough to act as a filler and allow the several parts to be firmly bolted together. Using the same design of post for all brackets and offset poles, irrespective of the number of blades, reduces greatly the number of posts to be carried in stock, as, with a few posts on hand, almost any arrangement of signals can be readily secured by putting on the necessary fittings. These fittings are, for the most part, the same as those used on the pipe poles, or are of the common interlocking fittings, so that the parts necessary to fit up any kind of a pole can be easily kept on hand. The matter of renewals in case of damage is also easily provided for, but few special pieces being required.

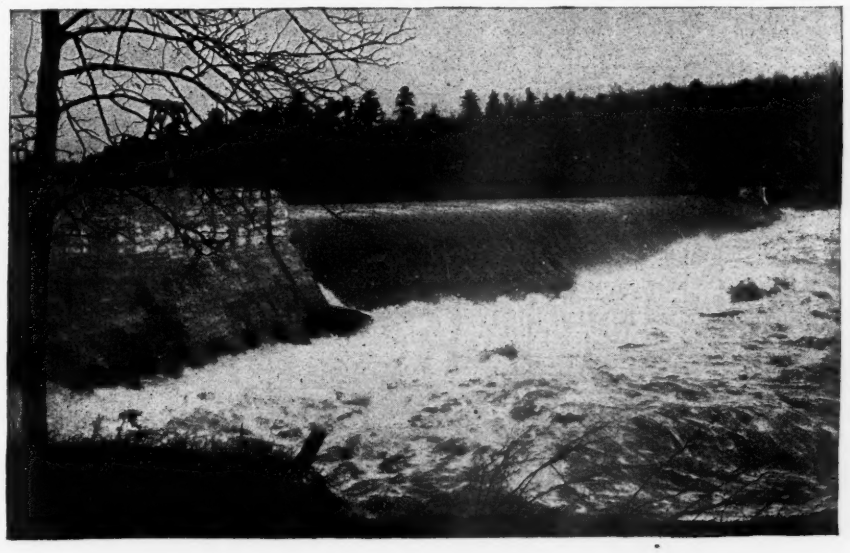


Fig. 1.—Main Dam and Water Gates—Mechanicville Transmission Plant.

The Generation of Electricity at Mechanicville, N. Y.

Probably no one subject in the field of applied electricity at present attracts such general interest as the development of large powers for transmission and its subsequent use in smaller units. Particularly in the West in the last two or three years has this work been carried on to a considerable extent, and there have either been completed or are now building such plants as those of the Power Development Co., of Bakersfield, and the Southern California Power Co., of Redlands, in California; the Colorado Power Co., of Colorado Springs, the Helena Water & Electric Power Co., of Helena, Mont., the Snoqualmie Falls-Tacoma-Seattle plant in Washington, and the power plant of the St. Anthony's Falls, at Minneapolis, Minn.

The Mechanicville plant probably contains no radical change in its mechanical or electrical features from the many large plants which have been completed, but there has been combined in this plant many of the most approved engineering methods which have made the former enterprises so successful.

Early in 1897, the attention of Mr. R. N. King, President of the Stilwell-Bierce & Smith-Vaile Co., of Dayton, O., was directed to the natural facilities for developing the water power near Mechanicville. This led to the subsequent building of the plant, which is 3 miles from Mechanicville, 11 miles from Troy, 18 from Albany, and 17 from Schenectady.

The hydraulic engineering features of the development were carried out by Mr. A. C. Rice, Chief Engineer of the Stilwell-Bierce & Smith-Vaile Co. As the General Electric Co. was to purchase most of the power, many suggestions were made by this company as to the electrical equipment. The result brought about by the co-operation of both hydraulic and electrical engineers is a power transmission plant, which is believed to be in every respect strictly representative of the most modern hydraulic and electric engineering practice.

General Location.—At the point chosen for the hydraulic development the physical conditions make the location an ideal place for a dam and power house. The banks and bottom of the river are of rock, as is Bluff Island, which divides the Hudson into two channels, and here during the greater part of the year is sufficient water to generate from 7,000 to 10,000 h. p.

The island is about one-third of the distance across the river from the western bank, the combined width of the two channels being about 12,000 ft. The western channel is used for the head and tail races.

In order to make the excavations for the power house and the main dams, heavy coffer dams were built across both streams. The work would have been completed within the time at first specified had not a very heavy freshet swept away part of the coffer dam, necessitating long delay before work could be resumed. The rock and shale from the excavations proved unsuitable for use in the concrete, for the dams and foundations. The broken rock used was brought on a special track from near Schenectady.

Dams.—The power house starts from and extends out into the river about 215 ft. and is connected with Bluff Island by a concrete dam, Figs. 1 and 2, 26 ft. high above the bed of the river, 10 ft. wide on top and 18 ft. wide at the base. The upstream face is vertical and the down stream face sloping. The top of this dam is at an elevation that the water will never reach, thus, no provision is made to take care of falling water on the down stream side, but the dam is provided with four arched waste gates 4 ft. wide and 6¾ ft. high, worked in the same manner as those in the main dam.

The main dam which is on the eastern side of the island, is built entirely of concrete. The upstream face is vertical, the down stream face is curved and provided with an horizontal apron 14 ft. wide which throws the falling water off horizontally, and thus effectually prevents wash or scour of the toe of the dam. The dam is 16 ft. high above the river bed, 8 ft. thick immediately below the crest, 16 ft. thick through the base and 30 ft. thick through base and apron. The dam is set between massive

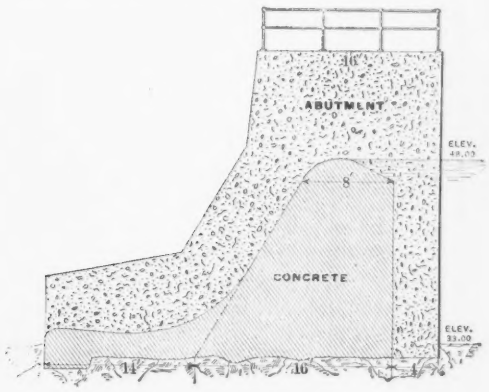


Fig. 2.—Section through Main Dam.

abutments anchored to the rock sides of the riverbank and island. The eastern is 20 ft long, 26 ft. high above river bottom, 16 ft. thick at the top and 34 ft. wide at the base. The western abutment is 100 ft. long, the other dimensions being similar to those of the eastern abutment. The length of the spillway between abutments is 800 ft. In the western abutment are 12 arched waste gates of ample proportions. Each gate is 4 ft. wide and 6 ft. high, and is opened and closed by a heavy iron hoist worked by rack and pinion. The eastern dam is practically a solid rock wall.

Between the west end of the power house and the Mechanicville highway a broad roadway has been built of earth and slate rock. To avoid any possibility of water finding its way through the embankment in case of very high water a concrete core was put in the center, starting at the solid rock and ending 2 ft. below the surface of the road. The embankment forming the roadway is 40 ft. wide on the top, 124 ft. at the base, and 18 ft. high at the deepest point.

The Power House.—The power house, shown in Fig. 3, lies between the west bank and the short concrete dam, nearly filling the space between the island and the west bank of the river. It is practically a continuation of the dam, and like the main dam is of concrete with the exception of the upper walls. The power house is a very substantial building, the foundations are carried down to the bedrock, and the house is carried on heavy steel box web girders resting upon steel I-beam columns. The latter are imbedded in concrete walls, carrying arches which form the floor of the generator room and the floor on which the wheel flumes rest. The walls form a separate and distinct tail race 22 ft. wide for each set of turbines, from which the water may be shut out at will.

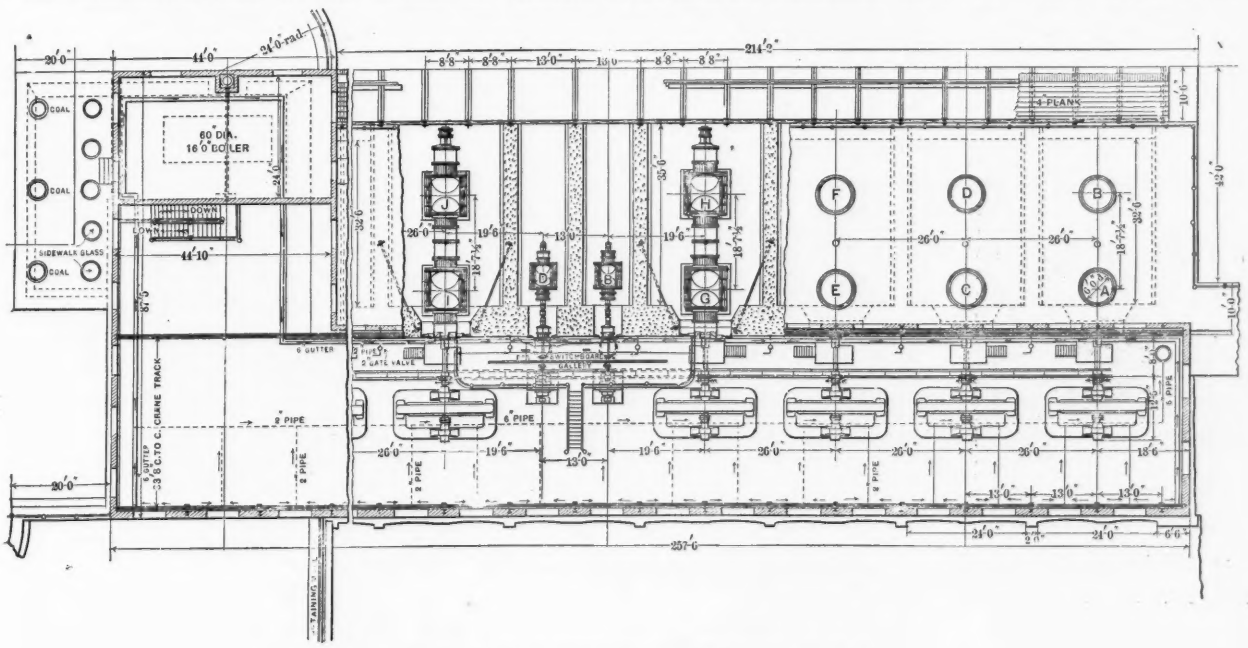


Fig. 3.—Plan of Power House at Mechanicville, N. Y.

The house is divided into two parts by a thick head wall. The upstream part contains wheel chambers for seven 1,000 h. p. wheels, five of which are at present used. The downstream portion contains the wheel governors, and the electrical apparatus. The length of the power house proper is 257½ ft., the width of the dynamo room between head wall and south wall 34 ft., and the width of the wheel chamber portion 32½ ft. The total width of the power house is 66½ ft. At the western end an L extension 44 ft. 10 in. wide runs up stream 87 ft. 5 in. This portion of the power house is of brick. A retaining wall runs down stream from the power house along the western bank a distance of 50 ft. The western stream running between the bank and the island forms the forebay, 300 ft. long. The main

tail race is 205 ft. wide and joins the main stream 750 ft. below the power house.

Arched chambers are provided for seven main wheels and two exciter wheels. Each main chamber is 32 ft. 6 in. long, 22 ft. wide and 17 ft. 5 in. high, and is provided with two 6 ft. manholes. Each exciter wheel chamber is 32 ft. 6 in. long, 17 ft. 5 in. high and 10 ft. wide. The head wall of the chambers is 6 ft. thick, the wall on the upstream and both sides 3 ft. thick. In the head wall of each main chamber is set a heavy cast iron cover, through which the turbine shaft passes in a watertight packing box, carrying the ring oil bearing for the shaft. The saving in space effected by the new arrangement of housing and coupling together of

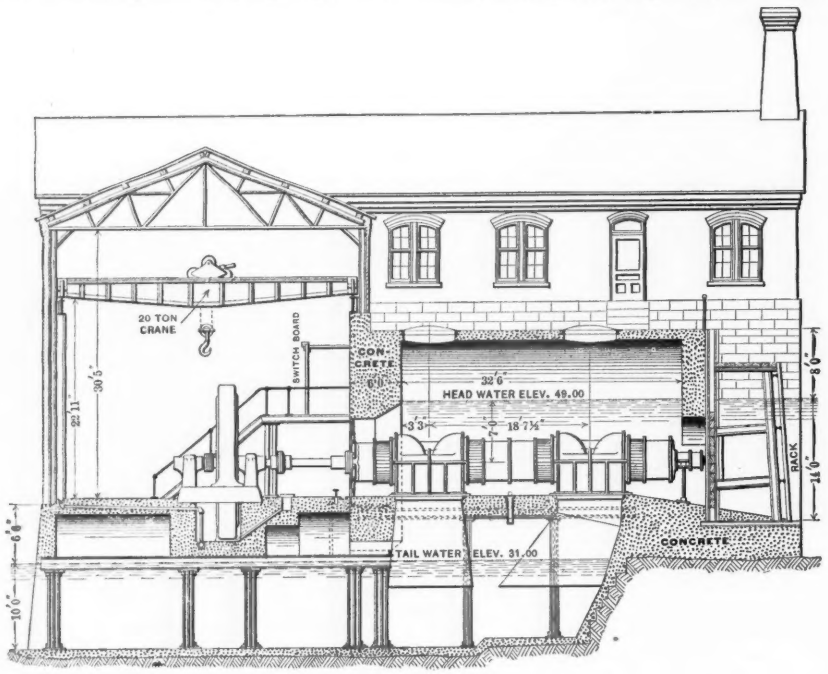


Fig. 4.—Section through Main Wheel Chamber.

the turbines, has made it possible to reduce considerably the size of the power house.

A 20-ton crane, from the works of Pawling & Harnischfeger, of Milwaukee, runs the entire length of the dynamo room.

Main Wheels.—The main wheel plant consists of ten pair of 42 in. horizontal Victor turbines of the latest type, built by the Stilwell-Bierce & Smith-Vaile Co., of Dayton, O., a section of one of these being shown in Fig. 4. Each main turbine, at the normal speed of 114 revolutions, is rated at 250 h. p. The total power of each set of turbines is 1,000 h. p. Five machines are now in position, the two additional turbines will be in place shortly. The head under which the water wheels are worked is 18 ft.

Exciter Wheels.—There will be three Victor turbines for the exciters. The wheels, shown in section in Fig. 6 are 18 in. in diameter, and designed to run at 259 r.p.m.

Draft Tubes.—Two draft tubes lead from each main turbine, the forward tube descending straight into the tail race beneath the power house, the rear or up-stream tube curving and flaring downward

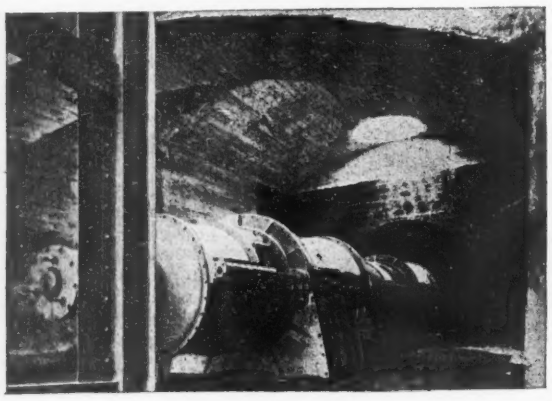


Fig. 5.—A Main Wheel Chamber.

and outward. Each tube is 9½ ft. in diameter at the bottom. Two draft tubes are also allotted to each set of exciter wheels, the setting following a similar arrangement. The rear tube is 4 ft. in diameter, the forward tube 3 ft.

Main Wheel Governors.—The speed of each set of main wheels is regulated by a Giesler governor, shown in Fig. 7. It is mounted on a platform directly over the turbine shaft, and between the head wall and the generator. This governor is very sensitive, and the gates can be entirely opened or shut in six seconds. The driving pulley is replaced by a rawhide pinion, giving a rigid connection between the governor and the wheel, making 4000 r.p.m. This type of governor is now in use in many power plants in this country, including those of Columbia, S. C.; Pelzer, N. C.; Lachine, Que.; West Kootenay, B. C.; Montmorency, Que.

The Improved "Snow" governors control the exciter-wheel gates.

Generators.—The dynamo room, Fig. 8, is well lighted by windows on all sides. It is 255 ft. long and 34 ft. wide, 30 ft. 5 in. in the clear from floor to roof truss, and 22 ft. from floor to crane. The ultimate generator capacity of the station will be 7,000 h.p. in seven generators, five of which are now running. They are unitooth, three-phase. 40-pole, 750 k.w., 114 revolution alternating current machines, having revolving fields, and wound to deliver to the transmission lines 36 amperes at a periodicity of 38 cycles and an electrical pressure of 12,000 volts. They are arranged to be run in parallel at constant voltage. By using the revolving field type of generator and thus obtaining this electrical pressure directly from the machine the use of step-up transformers to raise the voltage for transmission purposes is avoided. As the current is to run synchronous and induction motors for lights, and to be converted into direct current through rotary converters, a frequency of about 40 cycles was selected as most suitable for the different conditions required.

The alternators are similar in their main characteristics to those successfully used in the development of the power of the Lachine Rapids at Montreal. The armature frame or ring is of the box type, 15 ft. 4 in. in diameter and 36 in. wide. It is bolted to a base 18 ft. 2 in. long by 10 ft. wide, along which it may be moved parallel with the shaft, in order that the revolving field spider and poles may be uncovered, should occasion arise. The armature winding is protected on each side by iron shields.

The field ring is bolted to the spokes of the spider. It carries 40 poles, each securely fastened by two bolts to the ring. The whole revolves on a shaft 15 in. in diameter, provided with a rigid coupling on the turbine side bolted to a similar coupling on the turbine shaft. The dynamo shaft is extended for coupling to a vertical steam engine in case of necessity. The following reasons for selecting this type of alternator have been given by Mr. C. P. Steinmetz, of the General Electric Co:

"In addition to the advantage which the stationary armature type has over the stationary field type in allowing a high transmission voltage to be taken directly from the armatures, it allows of a fairly low saturation of the magnetic circuit, giving an almost straight saturation curve. This is preferable in power transmission, since a considerable increase in the voltage may be obtained if needed to cover excessive drop in the lines due to heavy loads and the voltage may be maintained even if the speed remains low."

The exciters are placed one on each side of the stairway leading to the switchboard gallery. They are 6-pole 100 k.w. 125-volt standard G. E. machines.

Switchboard.—The switchboard on a gallery on the north wall of the dynamo room is built up of nine highly polished panels of blue Vermont marble, each panel 7 ft. 6 in. high, 3 ft. wide and 2 in. thick. Of these nine panels, five are used for the generators and two for the feeders; one is the total output panel and the last is for the control of the exciters.

Among the other instruments each generator panel is supplied with the following: Beneath the two ammeters is an inclined coil voltmeter reading to 15,000 volts, and beneath this instrument are three single-blade, double-throw, quick-break, high-tension switches. These switches are to break currents of 12,000 volts, and are tested for currents of 21,000 volts. The switches are without handles. An eye is made in the end of each blade into which a hook may be inserted and the switch opened by the attendant from a safe distance. Further, to prevent any dangerous arcing from blade to blade marble barriers, 1¼ in. thick, 3 in. long and 12 inches wide from the face of the board, are erected between each blade.

On the left of each generator panel subbase are two 100-amp. double-pole, double-throw, carbon-break switches—one the field switch, the other the lighting switch. On the back of the panels are the high tension fuse blocks, designed for 20,000 volts, are of the snap-break expulsion type.

The lightning arresters are of the G2 short-gap type. The gap spaces in the lightning arresters at Mechanicville are very small (about $\frac{1}{32}$ in.) each space lying between two solid metal cylinders 2 in. in diameter and 2 in. long. The line is protected by double pole 2,000 volt arresters connected six in series to give the necessary number of spark gaps. There are three sets of these, one at Mechanicville, grouped around the first transmission pole in a small house 15 ft. square, one set on the Schenectady side of the Glenville bridge, where the overhead pole line connects with the underground cable, and the third at the works.

The line from Mechanicville to Schenectady is the only one that has been laid. It consists of three No. OOO B. & S. bare wire, this large gage being employed in order to give the line as high self-induction as possible. Self-induction is brought into the line in the shape of reactive coils where the natural self-induction is too small. The circuits are carried on poles 30 to 60 ft. long, and all eight in. in diameter at the top. Each pole carries one cross arm, on one side of which are two porcelain insulators of the triple petticoated type, a third being on the other side. For lightning protection a barbed wire, frequently grounded, runs along the tops of the poles.

At present all the machinery in the factory of the General Electrical Company is driven by electric motors, while the testing department demands an independent supply of current. The factory is run by a number of 250-volt motors running on the same circuit as the factory lights. These motors will not be changed and the steam plant which supplies them will be retained as a reserve in case the power from Mechanicville should fail. The electric power plant taking the place of the present steam plant at the works will consist of two synchronous motors, one of 500 k.w., the other of 100 k.w., and three 400 k.w. rotary converters The synchronous motors will be for the testing department and the converters to supply current to the factory motors.

The large engine driving the 500 k.w. multipolar generator is superseded by a 500 k.w. synchronous motor. This is a twelve-pole 400 revolution machine of the revolving field type, wound for 10,000 volts. The small engine driving the exciters is replaced by the 100 k. w. synchronous motor.

The three rotaries supplying a 250-volt current to the factory motors are ten pole, 400 k.w. machines, having two commutators and two sets of collector rings connected to independent windings on the armature. They receive the three-phase current from independent secondary coils of the same set of air blast transformers. When connected in multiple they furnish current at normal pressure of 250 volts, but as they may be called upon to furnish current to the testing department in case the de-

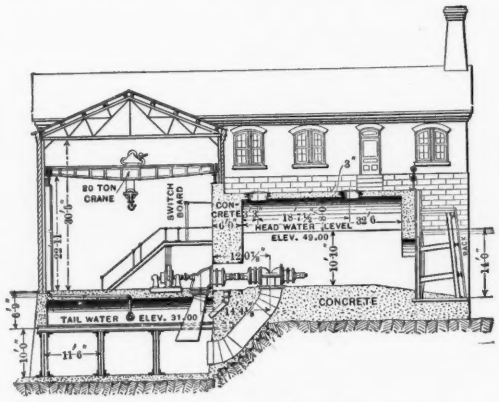


Fig. 6.—Section through Exciter Wheel Chamber.

mand exceeds the supply from the synchronous motor driven machine, they may be connected in series to give 500-volt current, working in parallel with the railroad generator, driven by the synchronous motor in the testing department.

The rotaries are worked in parallel and all the factory motors, the factory railroad and all the factory lighting are from the same direct current circuit, the latter on the Edison three-wire system, the neutral wire being secured by connecting the transformers for the rotaries in Y with their secondaries and bringing to the neutral wire a load from their common connection.

To make the entire system self-regulating in the

direct current distribution, and as far as possible independent of hand regulation, the rotary converters are given shunt field and powerful series field, so joined together that the machine works as one unit. With constant voltage in the generating station at no load, the counter e.m.f. of the rotaries as given by their shunt field is below the impressed e.m.f., and a lagging current is produced. The self-induction of the lines is thus in opposition to the voltage, which is so reduced as to give 250 volts at the commutator brushes of the rotaries. As the load increases the counter e.m.f. of the rotaries rises due to the series field until at full and overload it is greater than the impressed e.m.f., and the

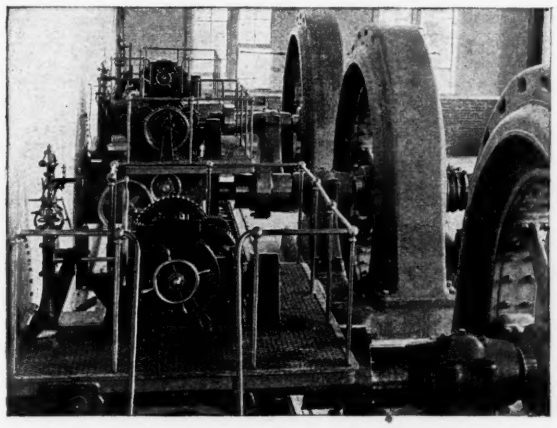


Fig. 7.—Main Wheel Governors—Giesler Type.

current becomes leading. The e. m. f. of self-induction of the lines is then brought partly in phase with the voltage which is increased so that in spite of the increased line current and consequently increased energy loss in the line, with constant generator voltage, the same voltage is produced at the commutator brushes of the rotaries at no load as at full and overload. This control is, threfore, automatic in every way, and did the synchronous motor not take current over the same line in varying quantities would suffice to render this control perfectly automatic, therefore, small series transformers are inserted in the lines leading to the synchronous motor, feeding a small synchronous motor-generator controlling the shunt field of the rotaries. By the combined action of their shunt and series fields, the voltage is automatically maintained constant at the commutator brushes of the rotaries and no hand regulation is required beyond that of readjustment in case the number of rotaries in operation is changed.

The entire construction of the dams, power house and lines has been carried out with excellent engineering skill by the National Contracting Company, of which Mr. G. H. Furman is General Manager. Mr. R. A. Mathews, Superintendent, and Mr. J. A. Leonard, Constructing Engineer. All of the electrical machinery has been furnished by the General Electric Company, and the hydraulic equipment by the Stilwell-Bierce & Smith-Vaile Co., of Dayton, O.

The officers of the Hudson River Power Transmission Company are: President, General Edmund Hayes, of Buffalo, N. Y.; vice-president, Mr. R. N. King, of Dayton, O.; treasurer, Mr. G. M. Furman, Newark, N. J.; superintendent, Mr. E. J. Richards, Boston, Mass., and manager, Mr. J. S. O'Shea.

The Steel Companies Consolidation.

We gave last week the main points, so far as they have been made public, of the consolidation of the Minnesota Iron Company, the Illinois Steel Company and the Lorain Steel Company. In The Iron Age of Aug. 25, we find a carefully prepared article which gives a good deal of information. The properties to be consolidated are the Minnesota Iron Company, which includes also the Duluth & Iron Range Railroad Company and the Minnesota Steamship Company; the Illinois Steel Company, which covers the Chicago, Lake Shore & Eastern Railroad and the Southwest and the Revere Coke Companies; the Lorain Steel Company and the Elgin, Joliet & Eastern Railroad. The leading spirits in the consolidation are Standard Oil men, and associated with them are J. P Morgan & Co., Morton, Bliss & Co., Marshall Field, R. P. Flower, Nathaniel Thayer, R. T. Wilson & Co., A. J. Forbes-Leith and others.

We are informed that in the valuation of properties the committee had the report of Windsor E. Richards and E. P. Martin of England, and later of John Fritz, and Messrs. R. W. Hunt, Robert Forsyth, C. Miller and Fayette Brown also acted as technical advisers.

The Minnesota Iron Company is probably the largest miner of iron ore in the world. Its mines are in the Vermilion range and the Mesaba range. To the close of the shipping season of 1897 this company has mined over 13,000,000 tons of ore, and it is expected that this year its output will be 2.7 millions. It has a splendid property in its railroad, its docks and its steamships and barges.

The Illinois Steel Company is so well known to our readers that we need to say little of it here. It owns 3,000 acres of improved coal lands in the Connellsville region, and its properties there will probably soon produce 120,000 tons of coke a month. It also owns between 5,000 and 6,000 acres of unimproved coal land in West Virginia. The company owns seventeen blast furnaces, with an annual capacity of 1,500,000 tons, and also vast steel works.

The Lorain Steel Company has a rail mill at Johnstown, Pa., and an important steel plant at Lorain, Ohio. Its Bessemer plant here has a rated capacity of 300,000 tons a year, and its finishing mills have a rated capacity of 180,000 tons a year of billets and rails. The company is now carrying out important improvements at Lorain, including two modern blast furnaces and a new blooming mill.

It is hardly worth while to speculate on the effect of this great combination on the steel industry. There are those that think it means war with the Carnegie interests. There are others who take what seems to be a more rational view, that the consolidation is a step towards harmonious working and control of rates.

On Wednesday morning of this week, Mr. E. H. Gary of the Committee announced that it has been decided to organize a new company, to be known as the Federal Steel Company, under the laws of New Jersey, and that the capital stock will be about $200,000,000, one-half preferred and one-half common. A syndicate to furnish working capital will be managed by J. P. Morgan & Co. It is expected that the new organization will be complete about Oct. 1.

The Algiers Dry Dock.

Commodore Mordecai T. Endicott, Chief of the Bureau of Yards and Docks, U. S. Navy, has issued a call for bids for building a dry dock at Algiers, La. Proposals will be received at the Bureau until 1 o'clock p. m., Monday, Oct. 31. By the act of Congress the limit of the cost of the entire work is $850,000. This is to be a combined floating and graving steel dock, with shore connections and all appurtenances complete. It is to be capable of lifting vessels of 15,000 tons displacement and 27 ft. draft of water. The description of the work which follows and the specifications for material and workmanship are taken from general specifications issued by Commodore Endicott under date of Aug. 25, but these are not reproduced in full.

Length over all will be 525 ft.; draft of water over keel blocks, 28 ft.; width in clear, not less than 100 ft. The dock is to be in the Mississippi River, in front of the naval reservation at Algiers, La., with ample depth of water for its operation in docking a vessel with 28 ft. draft of water at the lowest known stage of the Mississippi River at that point, and where the velocity of the current is low enough to admit of the convenient handling of vessels going into and out of the dock. The plans, specifications, and proposals will also include the wharf and moorings, or shore connections, necessary for the security and safe use of the dock. The dock must be designed to lift a ship of 15,000 tons displacement above the level of the river, and with a freeboard of not less than 2 ft. The entire structure must be of steel, except the keel blocks, bilge blocks and shores. The wharf or shore connections may be of wood, but preferably of steel.

It is the desire to give full latitude in the design of a structure that will fully meet the requirements of the naval service in a dock for the safe docking of a vessel of the limit of displacement stated in the act. In giving great latitude in the design of the dock, both as to its general features and details, the Government reserves to itself the right to weigh the relative merits of all the designs presented, and accept a proposition for the one which best meets its requirements.

The dock proper shall have transverse strength and stiffness sufficient for docking a battleship of 15,000 tons, with her entire weight carried by the keel blocks. The dock will be proportioned for a battleship weighing 15,000 tons, 450 ft. long, and having two-thirds of her weight concentrated in the middle half of her length. The greatest longitudinal deflection allowable will be 1 in 3,000, with most unfavorable load. The greatest transverse deflection allowable will be 1 in 1,800, with most unfavorable load. The dry dock and appurtenances must be completed and ready for final test within eighteen months from the date of the contract.

As the Mississippi River at extreme high stages may reach a velocity of six miles an hour, the moorings of the dock shall provide for this condition with the dock submerged. Provision shall also be made to prevent injury to the dock from floating drift, preferably by guards attached to the dock. The moorings shall be so located and arranged as to admit the shifting of the dock's position to some extent.

Extracts from the Specifications.

All steel shall be acid or basic open hearth, except in such cases as the particular kind may be specified.

Acid open-hearth steel shall contain, on cast analysis, not to exceed .07 of 1 per cent. of phosphorus, nor to exceed .05 of 1 per cent. of sulphur. Basic open-hearth steel shall contain, on cast analysis, not to exceed .05 of 1 per cent. of phosphorus, nor to exceed .04 of 1 per cent. of sulphur. Carbon, manganese and other elements shall be well balanced in both kinds of steel, and unusual variations shall be cause for special testing and investigation before acceptance. Check analyses on finished material shall be made for each cast of steel and shall not show a variation from the cast analysis exceeding 50 per cent. for any element. Full cast and check analyses shall be furnished by the manufacturer, and check analyses shall be made on drillings selected by the inspector and entered under his private mark.

Acid open-hearth steel in plates, shapes, and bars shall show on test a maximum strength of not less than 60,000 nor more than 70,000 lbs. per square inch; an elongation, after fracture on an original length of 8 in., of not less than 22 per cent., and a reduction of area at fracture of not less than 40 per cent. Basic open-hearth steel in plates, shapes and bars shall show on test a maximum strength of not less than 55,000 nor more than 65,000 lbs. per square inch; an elongation, after fracture on an original length of 8 in., of not less than 25 per cent., and a reduction of area at fracture of not less than 45 per cent. Both acid and basic open-hearth steel in rivets and rivet rods shall show on test a maximum strength of not less than 55,000 nor more than 60,000 lbs. per square inch; an elongation, after fracture on an original length of 8 in., of not less than 25 per cent., and a reduction of area at fracture of not less than 50 per cent.

Steel castings shall be acid open-hearth steel, and shall show on test after annealing a maximum strength of not less than 60,000 lbs. per square inch, and an elongation after fracture on an original length of 2 in. of not less than 20 per cent. All steel castings shall be carefully and thoroughly annealed.

The elastic limit of all steel shall be not less than one-half the maximum strength.

Specimens from plates, shapes and bars shall bend, when cold, 180° around once their thickness; when at or above a red heat, 180° flat, and after quenching from a dark yellow heat in water at a temperature of 80° F., 90° around twice their thickness; all without rupture on the outside of bent portion. Specimens from rivets or rivet rods shall bend 180° and close tight without rupture on outside of bent portion under any of the above conditions. Specimens from steel castings shall bend 90° around three times their thickness without rupture on outside of bent portion.

Finished material shall be true to section and shall not vary from calculated weight by more than 2½ per cent.

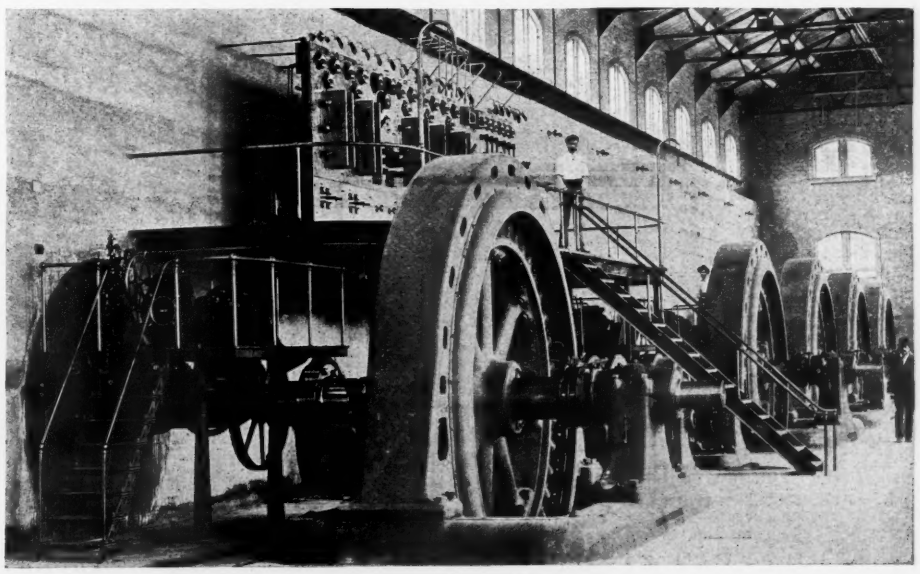


Fig 8.—Dynamo Room in Power House—Mechanicville Transmission Plant.

It shall be free from defects and of a workmanlike finish. The acceptance of all material is provisional on its compliance with the specification, and should any material prove defective at any time before final acceptance of the structure, it shall be rejected and promptly replaced by the contractor without additional cost.

No plate or shape will be used less than $\frac{7}{16}$ of an inch thick without written permission from the Chief of Bureau of Yards and Docks.

For punched holes the diameter of the punch shall not exceed the diameter of the rivet to be used by more than $\frac{1}{16}$ in. When the thickness of metal shall exceed the diameter of rivet the holes shall be drilled.

All holes shall be accurately spaced and punched to insure coincidence when assembled. Slight mismatching may be corrected by reaming, provided the driven rivet shall completely fill the hole; otherwise the material mispunched shall be rejected and new material promptly provided.

Rivets shall as far as possible be machine-driven.

Especial care shall be used with hand-driven rivets to insure complete filling of holes and tightness.

All plates for water-tight compartments shall be calked with a round-nose calking tool. All calking edges shall be sheared or planed to a smooth-beveled edge.

Statistics of the Railroads of the United States to June 30, 1897.

The Interstate Commerce Commission has issued an abstract of the forthcoming Statistician's Report of the operations of the railroads of the country for the fiscal year that ended 15 months since. From this abstract we copy the items shown below, with figures for the preceeding two years. These last are taken from the similar statement published in the Railroad Gazette of Dec. 31, 1897, in which were also given the totals for 1894.

Railroad Statistics for Year Ending June 30.

	1897.	1896.	1895.
Miles of railroad completed...	184,428	182,777	180,657
Increase in 12 months.....	1,652	2,120	1,949
Miles of track.....	243,444	240,129	236,894
Miles of road operated.....	183,284	181,983	.....
Number of corporations.....	1,987	1,985	1,965
Number in hands of receivers.	128	151	169
Mileage in hands of receivers.	17,862	30,475	37,865
Locomotives.....	35,986	35,950	35,699
Cars, passenger	33,626	33,003	33,112
Cars, freight	1,221,730	1,221,887	1,196,119
Cars, total	1,297,480	1,297,649	1,270,561
Cars and eng. with p'w'r br'ks	525,286	448,854	362,498
" with automatic couplers.	678,725	545,583	408,856
Employees.....	823,476	826,620	785,034
Employees per 100 miles of road.....	449	454	441
Employees in M. W. dep't.....	134	134	128
" in Maint. equip't..	88	92	88
Capital stock, com'n, millions.	$4,367.1	$4,256.6	$4,201.7
" stock, pref'd, millions.	937.6	970.0	759.6
" stock, total, millions..	5,304.7	5,226.5	4,961.3
Funded debt, millions.....	5,270.4	5,340.3	5,385.5
Current liabilities, millions....	578.5	.....	616.8
Total stock and f'd debt, millions	10,635.0	10,566.9	10,346.8
Total stock and f'd debt per mile of road.....	59,620.0	59,610.0	59,650.0
Dividends paid, millions.....	87.1	87.6	85.3
P. c. st'k rec'v'g no dividend..	70.1	70.0	70.0
P. c. bonds rec'v'g no interest.	13.6	16.3	13.4
Av. div. on div.-paying stock.	5.4	5.6	5.10
Gross earnings, year, passenger, millions	$251.1	$266.6	$252.2
Gross earning, year, freight, millions.....	772.8	786.6	730.0
Gross earnings, year, total, millions	1,122.1	1,150.2	1,075.4
Operating expenses, millions..	752.5	773.0	725.7
Net earnings, millions.....	369.6	377.2	349.7
Other income, millions.....	125.1	129.0	132.4
Net income, millions.....	494.7	506.2	.....
Fixed charges, etc., millions..	413.4	416.6	426.0
Net avail. for div., millions...	81.3	89.6	56.1
Dividends paid, millions.....	87.4	88.1	86.0
Passengers carried, millions...	489.4	511.8	507.4
" one mile, millions.	12,256.9	13,049.0	12,188.4
Freight carried, million tons..	741.7	765.9	696.8
" one mile....	95,139.0	95,328.4	85,227.5
Employees killed	1,693	1,861	1,811
Employees injured	27,667	29,969	25,696
Passengers killed	222	181	170
Passengers injured	2,795	2,873	2,375
Other persons killed	4,522	.....	.....
Other persons injured.....	6,269	.....	.....

The operated mileage differs from the total length because some sections of road are used by two or more companies, and because some roads do not promptly send in their reports.

The average per mile of earnings, passenger journeys and passenger and freight revenue, and the average train loads are not given in the abstract, so we shall defer further notice of this subject until the full report comes out.

Nearly 1,300 Miles of New Road in the First Half of 1898.

The revised reports given below indicate that the new railroad built during the first six months of this year is 1,292 miles, more by 200 miles than the preliminary statement which appeared in the Railroad Gazette for June 24 last. The corrected figures show Alabama to be still in the lead, with 147 miles to her credit. Then follow Missouri, 92 miles; Louisiana, 74 miles; California, 73; North Carolina, 70; New Mexico, 67; Georgia, 62 and Oklahoma Territory, 61. These eight states and territories, comprising one-sixth of the population and territory of the United States, have built more than half the mileage of the first six months of the year. At the other end are 16 states and territories without a single mile of new road to their credit: Connecticut, Iowa, Kansas, Kentucky, Massachusetts, Nebraska, Nevada, New Hampshire, New Jersey, North and South Dakota, Rhode Island, Utah, Vermont, Wyoming and the District of Columbia. If the same proportion of new buildings hold for the second half of the year, the new mileage for the entire year will no doubt exceed 2,500 miles, which is more by several hundred miles than that of any year since 1894. The corrected figures show that Canada has added during the same period 108 miles to her railroads, and Mexico 174 miles. The figures in detail by states are as follows:

NEW MILEAGE BY STATES.

States.	Companies.	Miles.	States.	Companies.	Miles.
Alabama	4	147.6	New Mexico	1	67.
Alaska	1	3.	New York	4	26.5
Arizona	2	26.	North Carolina ...	7	70.85
Arkansas	6	56.6	Ohio	2	29.
California	4	73.51	Oklahoma Territory	3	61.
Colorado	3	21.5	Oregon	2	44.3
Delaware	1	1.75	Pennsylvania	7	12.72
Florida	5	49.	South Carolina	2	18.
Georgia	5	62.	Tennessee	1	7.
Idaho	1	8.55	Texas	10	60.58
Illinois	2	5.75	Virginia	4	36.
Indiana	2	16.	Washington	2	3.5
Indian Territory..	3	41.6	West Virginia	2	10.
Louisiana	3	74.3	Wisconsin	2	23.
Maine	2	17.			
Maryland	1	10.	United States...	107	1,291.85
Michigan	2	16.5			
Minnesota	2	49.5	Canada		108.5
Mississippi	4	38.5	Mexico		174.46
Missouri	4	92.			
Montana	1	11.74			

Particulars as to this new building by individual roads and by states with the routes are given in detail below:

UNITED STATES.

Alabama.

Alabama & Tombigbee.—On line from Lower Peach Tree to Coffeeville.....	4.
Mobile & Ohio.—End of track to Montgomery, 97.6 miles; Warrior Branch, 10 miles; Blocton Branch, 13 miles; total.....	120.6
Plant System.—Alabama Midland extension from end of track to Elba.....	21.
Seaboard.—Toward Healing Springs.....	2.
Total.....	147.6

Alaska.

Skaguay & White Pass.—Skaguay to end of track.	3.

Arizona.

Arizona & Southeastern.—Deer Point toward Mexican boundary line..	1.
Gila Valley, Globe & Northern.—Geronimo to San Carlos.....	25.
Total	26.

Arkansas.

Arkansas Central.—Central City to a point two miles beyond Charleston	15.
Des Arc & Northern.—Higginson to Hunterton.....	15.6
Little River Valley.—Extension from Morris Ferry west toward Indian Territory line.....	4.
Louisiana & Northwest.—End of track toward Magnolia, Ark.....	10.
Mississippi River, Hamburg & Western.—Hamburg toward the Mississippi River.....	4.
White River, Lonoke & Western.—Panola to Lonoke....	8.
Total.....	56.6

California.

Daggett & Borate.—Daggett to Borate.....	10.
Pacific Coast.—Union to Betteravia.....	4.
San Francisco & San Joaquin Valley.—End of line south to Bakersfield....	35.6
Southern Pacific.—Ventura Junction to Nordhoff. 15 miles; Montalvo to Oxnard, 4.4 miles; Pomona Junction to Chino, 4.51 miles; total.....	23.91
Total.....	73.51

Colorado.

Colorado & Northwestern.—Sunset to Ward.....	13.
Florence & Cripple Creek.—Golden Circle extension, from end of track, beyond Goldfield, to Victor....	2.5
Rio Grande & Pagosa Springs.—Chromo to Price..	6.
Total..	21.5

Delaware.

Queen Anne's.—Extension at Lewes.....	1.75

Florida.

Atlantic, Valdosta & Western.—The Suwannee River to Fort Moniac.....	24.5
Ellaville, Westlake & Jennings.—End of track to Belleville.....	7.
Fort White & Southern.—Sautafe River to Cow Creek Camp.....	5.
Gainesville & Gulf.—Fort Drane to Fairfield.....	2.5
Tallahassee Southeastern.—Tallahassee to end of track.	10.
Total.....	49.

Georgia.

Bainbridge Northern.—Cyrene Junction to Eldorendo.....	4.
Bruton & Pineora.—Bruton to Stillmore.....	38.
Georgia Pine.—Corea to Plattsville.....	7.
Stillmore Air Line.—Extension at Stillmore.....	5.
Valdosta Southern.—Clyattville to Sanderson.....	8.
Total.....	62.

Idaho.

Northern Pacific.—On Spokane & Palouse Branch, from Pullman toward Lewiston.....	8.55

Illinois.

Chicago Terminal Transfer.—Franklin Park to Desplaines River..	.75
Illinois Central.—Chicago & Texas line, from McClure to Gray's Point.....	5.
Total.....	5.75

Indiana.

Chicago & Southeastern.—Anderson toward Muncie....	5.
Chicago, Indiana & Eastern.—Fairmount to Swayzee	11.
Total.....	16.

Indian Territory.

Arkansas & Choctaw.—End of track to Choctaw..	12.
Kansas City, Pittsburgh & Gulf.—Fort Smith Branch, from Fort Smith Junction to the Poteau River.....	14.6
St. Louis & Oklahoma City.—Sapulpa toward Oklahoma City.....	15.
Total.....	41.6

Louisiana.

Arkansas, Louisiana & Southern.—Minden toward Cotton Valley..	6.
Shreveport & Red River Valley.—Shreveport to Coushatta....	45.
Southern Pacific.—Extension of St. Martinsville Branch, from St. Martinsville to Arnaudville....	23.3
Total....	74.3

Maine.

Bridgton & Saco River.—Bridgton to Harrison.....	5.
Washington County.—On line from Ellsworth to Calais.....	12.
Total.....	17.

Maryland.

Chesapeake Beach.—District of Columbia line to Marlboro.....	10.

Michigan.

Detroit & Lima Northern.—Extension into Detroit.	16.
Manistee & Grand Rapids.—Terminal in Manistee.	.5
Total.....	16.5

Minnesota.

Duluth & Iron Range.—Waldo to Colquet River Junction.....	18.5
Great Northern.—Fosston Branch, from Deer River to the Mississippi, 17 miles; from Fosston east, 14 miles; total.....	31.
Total.....	49.5

Mississippi.

Laurel & Northwestern.—Laurel toward Raleigh..	3.
Mobile, Jackson & Kansas City.—Mallett to end of track, beyond Merrill City.....	21.
Natchez, Columbia & Mobile.—Ruth to end of track.	1.5
Pearl & Leaf Rivers.—Hattiesburg to end of track, with laterals.....	13.
Total.....	38.5

Missouri.

Kansas City, Eldorado & Southern.—Walker to end of track.....	6.
Kansas City, Osceola & Southern.—Osceola toward Bolivar	30.
Kansas City, Pittsburgh & Gulf.—Kansas City & Northern Connecting line, from Plattsburg to Pattensburg.....	40.
St. Louis Southwestern.—Gray's Point Terminal extension, from Delta to Gray's Point.....	16.
Total.....	92.

Montana.

Northern Pacific.—End of track to Twin Bridges..	11.74

New Mexico.

El Paso & Northeastern.—Texas State line to Alamogordo	67.

New York.

Erie & Central New York.—End of track to Cincinnatus.....	9.
Lehigh Valley.—Seneca County extension, from Waterloo to Seneca Falls.....	2.75
Long Island.—Great Neck & Port Washington extension of the North Shore terminus to Port Washington...	4.25
Terminal of Buffalo.—Blasdell to Depew.....	10.5
Total.....	26.5

North Carolina.

Atlantic Coast Line.—Southeastern line, from Elrod to Ashpole.....	11.25
Carolina & Northwestern.—Hickory to Newton...	10.
Durham & Charlotte.—Johnson City to end of track.....	3.2
Moore County & Western.—Craigrownie to end of line.....	3.
Raleigh & Cape Fear.—Raleigh toward Lillington.	3.
Southern.—North Carolina Midland extension, from Mocksville to Mooresville.....	27.4
Wellington & Powellsville.—End of track toward Ahoskie	13.
Total.....	70.85

Ohio.

Detroit & Lima Northern.—Columbus Northwestern extension, from Bellefontaine to St. Johns..	24.
Ohio Valley & Junction.—Parral to Canal Dover..	5.
Total.....	29.

Oklahoma Territory.

Choctaw, Oklahoma & Gulf.—Fort Reno to Geary.	17.
Hutchinson & Southern.—Medford to Blackwell....	26.
Kansas & Southeastern.—Hunnewell to Blackwell.	18.
Total.....	61.

Oregon.

Astoria & Columbia River.—Clifton to Gobble.....	39.3
Columbia Southern.—Wasco to Klondike.....	5.
Total.....	44.3

Pennsylvania.

Cornwall.—Branch to Colebrook Furnace Plant tracks.....	.25
Delaware, Susquehanna & Schuylkill.—Extension on Oneida Branch to New Harwood.....	.77
Kinzua & Tiona.—Extension toward Tiona.....	1.
North Bend & Kettle Creek.—Deep Hollow to Brooks' Siding, 1.75 miles; extension of Lebo Run Branch to Black Forest, 2.75 miles; total.....	4.
Pennsylvania.—Extension of Scalp Level Branch..	2.9
Reynoldsville & Falls Creek.—London Mine to Pancoast Mine, 0.4 miles; Rathmel to Maplewood Mine, 0.2 miles; Rathmel to Feeley Run Mine, 1.2 miles; total.....	1.8
Salisbury Branch.—West Salisbury to end of track.	2.
Total.....	12.72

South Carolina.

Pickens.—Pickens to Easley.....	9.
Seivern & Knoxville (Greenwood, Anderson & Western).—Alethia to Batesburg.....	9.
Total.....	18.

Tennessee.

Tennessee & Cumberland River.—End of track to Tennessee Ridge.....	7.

Texas.

Beaumont Wharf & Terminal.—Extension of belt line around Beaumont.....	4.
Cane Belt.—Eagle Lake toward Bonus.....	4.5
Chicago, Rock Island & Pacific.—Chicago, Rock Island & Texas extension, from Bridgeport toward Jacksboro.....	15.
El Paso & Northeastern.—El Paso to New Mexico State line.....	19.
El Paso Southern.—In El Paso.....	.75
Gulf & Brazos Valley.—Peck City toward Mineral Wells.....	6.
Pecos Valley & Northeastern.—Amarillo to end of track.	2.
Southern Pacific.—Branch from the Austin & Northwestern line, near Fairland, to Sand Stone Mountain.....	1.33
Texarkana & Shreveport.—Wallace to end of track.	5.
Texas State.—Extension west.....	3.
Total	60.58

Virginia.

Alberene.—End of track to Alberene.....	9.5
Norfolk & Portsmouth Belt.—Berkeley to Port Norfolk.....	6.5
Norfolk, Virginia Beach & Southern.—End of track to Munden.....	15.
Richmond, Petersburg & Carolina.—Petersburg to end of track.....	5.
Total.....	36.

Washington.

Portland, Vancouver & Yakima.—Extension toward Yakima.....	2.5
Shelton Southwestern.—Summit toward Prairie Lake.....	1.
Total.....	3.5

West Virginia.	
Cheat Valley.—Rowlesburg to end of line	6.
Little Kanawha.—Elizabeth to Palestine	4.
Total	10.
Wisconsin.	
Great Northern.—Extension from Saunders	12.
Washburn, Bayfield & Iron River.—Completion of line from Washburn to Iron River and to Bayfield	11.
Total	23.
CANADA.	
Canadian Pacific.—Crow's Nest Pass extension, from end of track to about 30 miles west of the Pass, 70 miles; Columbia & Western extension, from Robson, B. C., to new lock, 3 miles; total.	73.
L'Epiphanie & L'Assomption.—L'Assomption, Que., to Charlemagne, 6 miles; St. Paul to Charlemagne, 4½ miles; total	10.5
Newfoundland.—Brigus to Tilton and Harbor Grace to Carbonear	25.
Total	108.5
MEXICO.	
Chihuahua & Pacific.—Chihuahua west	1.86
Coahuila & Zacatecas.—End of track to Concepcion del Oro	36.
Jalapa RR. & Power Co.—Jalapa to Teocela	18.6
Mexican Central.—Jimenez toward Parral	27.
Mexican Industrial.—Belt line around the City of Mexico	5.9
Mexican National.—Reata Junction toward Monterey	15.
Mexico, Cuernavaca & Pacific.—Cuernavaca to Puente de Ixtla, 37 miles; Los Anates to Iguala, 9 miles; total	46.
Rio Grande, Sierra Madre & Pacific.—Branch to San Pedro mines	4.1
Torres & Priestas.—Torres to La Colorado	20.
Total	174.46

A New Steel Car Wheel.

An important step forward in the tedious development of a steel car wheel seems to have been taken by the design and use of the Canda steel wheel shown by the engraving. Several years ago the Chrome Steel Works of Brooklyn, New York, began experimenting with chrome steel for wheel making. They found that they could produce a metal sufficiently hard and tough for the tread and flange of a street car wheel, but the problem of making a wheel in which this metal could be utilized was a difficult one, and the Canda patent wheel was the solution. The features of this wheel are mild steel spokes with a hard chrome steel rim and a soft cast hub.

The diagrams show the leading features of the new wheel. Fig. 1 is a plan of the spokes as they are laid in the mould. Figs. 2 and 3 give a side elevation and a perspective view of a spoke. Fig. 4 is a section of the finished wheel; this also shows how the spokes are held in the hub and rim. The spokes are made from T-shaped mild steel. They are cut to the proper taper of the web and then forged to shape. In the larger wheels, where there are nine spokes, the inner corners are chipped from the flanges so as to give them room in the hub. (See Fig. 1.) In seven-spoke wheels the spokes have room enough and the corners are not removed.

When the wheels are cast the ends of the spokes are embedded in both rim and hub, the half-inch holes being filled with the metal. This dowells them

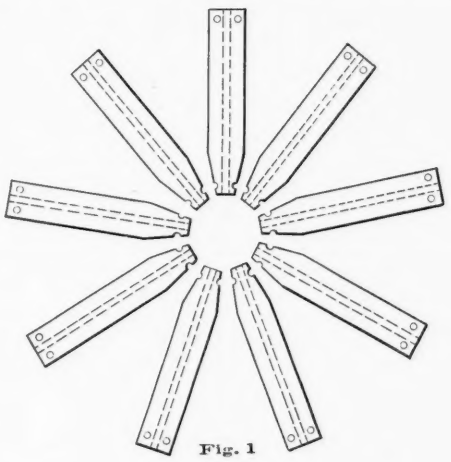


Fig. 1

Fig. 2

Fig. 3

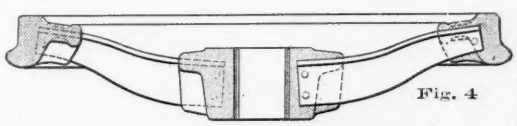
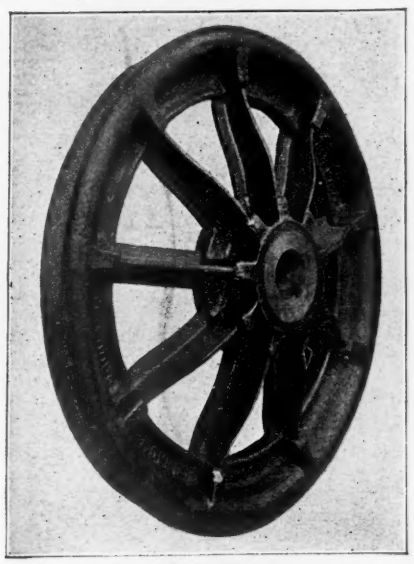


Fig. 4

The Canda Steel Wheel for Street Cars.

fast and at the same time by a special treatment the spoke is firmly welded in place. The rim itself is of a hard and tough quality of chrome steel. This is cast first and afterwards the hub is poured. When the wheel is cool it is taken to the annealing furnace. The annealing removes internal strains and at the same time produces a remarkable change in the quality of the rim.

The wheels are very strong; the tensile strength of the rim being as high as 80,000 lbs. per sq. in. Under the drop they easily withstand the tests usual for 600 lb. steam wheels, although weighing but half as



The Canda Steel Wheel.

much. In actual service breakage is practically out of the question. It is found easy to give all the necessary strength to the smallest flanges. This will be a great advantage in wheels used on grooved rails, where broken flanges are a very serious matter.

The wheels have not been in use long enough to develop a very high mileage. They are sold to the roads at three times the guaranteed life of cast iron wheels in the same service. The wheels are being used on the roads of the Consolidated Traction Co. of Jersey City, and from the records here obtained it appears that the guarantee will be easily met. Chrome steel can be made of any degree of hardness, and this method of wheel construction permits the tire to be of a quality capable of giving the best wearing surface.

From the design of the wheel a large amount of metal is available for wear. By grinding to shape (should the flanges change their form), the life of the wheel may be prolonged to an extent which cannot be guessed. These wheels are made and sold by the Chrome Steel Works of Brooklyn, N. Y.

Thirty-five-ton Steel Forging.

The Bethlehem Iron Company, of South Bethlehem, Pa., has recently completed the shaft shown in the engraving. It is one of a group of six similar forgings furnished by them to the Edward P. Allis Co., of Milwaukee, for the 7,500 h. p. engines which are to be placed in the Ninety-sixth street power station of the Metropolitan Street Railway Co. at New York.

The test-pieces showed an elastic limit of 35,000 lbs. per sq. in., and an elongation of 25 per cent., the material used being the well known fluid compressed open hearth steel, made at the Bethlehem works. The shafts were forged hollow on a mandrel, and are said to be the largest forgings of this character ever made. They measure 37 in. through the fly-wheel fit; 34 in. through the journals, and 30 in. through the crank-web fit. The axial hole is 16 in. diameter; the length over all 27 ft. 4 in., and the estimated weight 70,000 lbs.

A shaft of the same type is now being made at the same works for one of the power stations of the Boston Elevated Railway Company. This is to be an even more remarkable forging than that mentioned above, as the specifications have called for the highest grade of fluid compressed nickel steel, annealed and oil-tempered. The material must show an elastic limit of 50,000 lbs. per. sq. in., and an elongation of 18 per cent., in test-pieces 1 in. in diameter and 10 in. long. The actual dimensions are to be as follows: Diameter of fly-wheel fit, 37 in.; diameter of journals, 34 in.; diameter of crank-web fit, 32 in.; diameter of axial hole, 17½ in., and length over all, 27 ft. 10 in. The estimated weight is 63,000 lbs.

This shaft will be used for an 8,000 h. p. engine which is to be furnished to the Boston station by the Corliss Steam Engine Company, of Providence, R. I.

A Thirty-five Ton Hollow Steel Shaft, Forged by the Bethlehem Iron Co.

The Economical Aspects of Mechanical Draft, with Special Reference to Central Stations.

By Walter B. Snow.

Although the general advantages claimed for mechanical draft are now pretty well understood by general station managers, yet it is because this subject is of such obvious importance to them that this article has been prepared, even at the risk of repeating some well-known facts. In a boiler plant such as is used in the central station sudden demands are certain to be made, so that reserve capacity is always desirable, and the primary factor in the combustion of coal, namely, the draft, should be both positive and flexible. That the fan fulfils these two conditions must be admitted. The draft created by it is independent of the condition of the weather, and is as strong on warm, muggy days as on those that are cool and crisp. According to the requirements its intensity and the volume of air supplied can be varied at will, or by automatic regulation may be always graduated to the conditions. Absolute control of the intensity of the draft is manifestly necessary to the maintenance of constant steam pressure. An automatic regulator for mechanical draft increases the speed of the fan as the steam pressure falls, and may be so set that a drop of one pound pressure will instantly increase the draft from minimum to maximum.

In addition, the fan is readily adapted to all conditions, may be applied for either forced or induced draft, as an accessory to the chimney, or as a substitute for it. It is portable in its character, and, unlike the chimney, remains a valuable asset, even after its utility in a given location has passed away. It is also an important factor in smoke prevention, and practically indispensable in the burning of fine, low-grade fuels.

But it is with its purely economic features that the engineer is most deeply concerned. Broadly stated, the ultimate efficiency of a steam boiler depends on three principal factors:

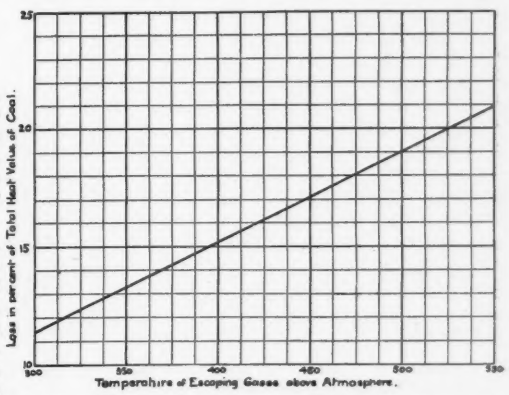
First—The primary cost of the entire plant, and the fixed charges thereon.

Second—The quantitative efficiency of the plant as a means of burning the fuel supplied, and transferring its heat to the water evaporated.

Third—The operating expense, including the cost of the fuel.

These factors are interdependent, and in so far as possible should be considered in any discussion of the economical aspects of mechanical draft.

No greater waste occurs in modern steam boiler practice than that which is inherent in the employment of a chimney for the production of draft, namely, that due to the loss of heat in the escaping gases. The loss of efficiency due to temperature of the escaping gases is very clearly shown by the accompanying curve. As the chimney depends for its action upon the maintenance of a temperature difference between the internal gases and the external air, it is manifest that this waste can never be eliminated. It may be palliated, it is true, by the building of higher chimneys, so that the same intensity of draft may be obtained with a lower stack temperature. But such means of providing for the utilization of the otherwise waste heat is expensive. For instance, if, with an external temperature of 60° and an internal temperature of 500°, sufficient intensity of draft is produced by a chimney 100 ft. high, it will require a height of 175 ft. to produce the same draft when the temperature of the gases is reduced to 250°. In addition, the means provided for extracting this heat will increase the resistance, and provision for overcoming the



Loss of Efficiency from Escaping Gases in Chimneys.

(*Continued on page 634.*)

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At 32 Park Place, New York.

EDITORIAL ANNOUNCEMENTS.

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussion of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns pesent only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially either for money or in consideration of advertising patronage.*

The gross and net earnings of the railroads of the United States for the half year ended with June 30 have been compiled by the Financial Chronicle for 186 roads working 136,843 miles. The gain in gross was over 51 million dollars, or 11.73 per cent. The gain in operating expenses was 33⅓ million dollars, or 10.74 per cent. The gain in net was 17.8 millions, or 14.18 per cent. The tabulation of the figures for the six years beginning with 1893 and ending with 1898 is peculiarly interesting. The gain in gross in 1893 was over 15 million dollars, and in 1894 the gross earnings fell off 68.8 millions. Then it increased 13 millions in 1895, 18 millions in 1896, decreased 1.7 millions in 1897, and in 1898 increased 51.1 millions. In other words, the gross earnings have considerably more than recovered from the terrible effect of the silver panic of 1893. In net, the lost ground has also been recovered. The increase in 1893 over the preceding year was 1¼ millions. In 1894 the decrease was 23½ millions. In 1895 the increase was 7.3 millions, in 1896 it was 4.1 millions, in 1897 it was 6.8 millions, and in 1898 17.8 millions. Of course it is not necessary to go far to seek the reasons for the great gain in the returns now collected. The grain movement was immense; the farmers had profited by great crops and high prices; the cotton movement was large, and business in general had revived, and, fortunately, the war did not interrupt business to anything like the degree which we had expected, largely, perhaps, because of the absolute collapse of the Spanish naval operations. In looking over the country it appears that almost every group of railroads in the United States shares in the increase in gross, although the New England roads show a small decrease in net. The Pacific group has the greatest increase, namely, 25 per cent. in gross and 47 per cent. in net. The Southwestern group has a gain of 30 per cent. in net, while in the Northwestern group the gain in net is only 10 per cent. Among individual roads the greatest gain in gross is shown by the Southern Pacific; then follow in order the Pennsylvania, the Burlington, the Atchison, the Northwestern, the Illinois Central, the Northern Pacific and the St. Paul. These are all that show gains in gross of over two millions for the half year. In net the Southern Pacific again precedes, the Pennsylvania, of course, not appearing in this table. The next railroad in amount of gain in net is the Northern Pacific, then come the Atchison, the Baltimore & Ohio, the Union Pacific and the Illinois Central. These are the only roads which show gains of over one million.

Street Railroad Development.

In Boston, December, 1882, 56 street railroad officials organized the American Street Railway Association, which next week again returns to fill the 20,000 or more square feet of exhibit space in Mechanics' Hall with the products of 16 years of development, and to discuss in the light of practical experience many of the same questions that only a few years ago received a vague treatment founded largely on suppositions. When the association was formed horses jogged along at a three-mile gait, drawing bob-tail cars capable of seating possibly 20 persons and running on a single bar of iron with a groove formed in its upper surface for the flange of the wheel. One of the important questions in the operating expense account 16 years ago was the price of oats and hay, but now a more profitable topic is the cost of electricity per kilowatt output at a plant like the Albany Street power station, where 25,000 h. p. can be generated. Those flat rails are still being used, but not for car wheels. Under the ground, a very few feet below the center of the present steel rails, the old iron will be found in certain parts of Boston, well rusted but bonded together and serving the useful purpose of conducting the return current back to the power station.

Some idea of the extent of the present system may be obtained by a glance at the doings of the street railroads in Boston last year: The Boston Elevated Railway Co. took possession of the property of West End Street Railway Co., Oct. 1, 1897, under a lease of 25 years. It now controls all the street railroad lines in Boston and ten other cities and towns in suburban districts. The mileage of the surface lines controlled by this company at the end of last year was 305, all of which, excepting about three miles, is worked by electricity. There were then 2,648 cars and 5,100 employees. Last year over 196,332,000 passengers were carried, of which nearly 23,778,000 were free transfer passengers. The working expenses were $6,213,709, and the passenger earnings were $8,536,286, which is over 13 per cent. of the total receipts of 175 of the most productive street railroad properties in the United States in 1897.

The improvement in the machinery in 16 years has been so rapid and the efficiency of the apparatus now in service is so high that any step in advance which may be made in the future must result from a careful study of the engineering questions involved. The saving of one per cent. of the cost of motive power may represent as much labor, expense and real engineering skill as the saving of ten per cent. but a few years ago. The managers of street railroads are not content with the progress of the past or attainments of the present; and, for the purpose of outlining possible means of a greater economy, there have been printed in this issue of the Railroad Gazette discussions of many questions that affect directly the question of generation of power and indirectly the methods of working street railroads.

The interest in the question of generation of power is as general as the subject is important, and a right understanding of it means a saving in the first cost and working expenses of the road. This last statement is made after giving due weight to the important fact that the motive power item averages only about 11 per cent. of the total working expenses of a street railroad, and also realizing that this percentage will probably not be increased or diminished to any considerable extent for years to come.

This condition has not always prevailed, however, for the improvement in apparatus the first ten years of electric railroading was the chief cause of the gradually increasing economy. Some of these conditions have been noted by Mr. Ennis in the paper published elsewhere in this issue. It can be safely asserted that the time has come when the efficiency of the machinery used in central stations has about reached a maximum, and any considerable increase in the amount of energy that can be got out of the coal pile and converted into useful work at the car wheels must result from other means than the increase in the maximum efficiency of the apparatus used.

One of the ways to increase the economy of a steam generating plant is discussed elsewhere by Mr. Walter B. Snow. In his article on "Mechanical Draft," Mr. Snow presents an argument based on facts and figures for its extended use. It is worthy of note that this subject has been developed in about the same period of time in which the electric railroad has made its great strides, and although one of the younger branches of mechanical engineering, the time has come when the designer of a central station cannot wisely disregard this means of obtaining a higher efficiency in the generation of steam. Furthermore, if one should draw conclusions from Mr. Snow's article, this can be done at a lower cost than by means of the most universal practice of putting up a high smokestack at a correspondingly high expense.

The progress in the development of street railroads has, after all, been a growth, but a very rapid one. In this connection might be mentioned the increasing use of alternating current machinery, about which much has been written but too little generally known. Those competent to draw conclusions on the question of the economy and efficiency of the two types of machinery have been led to believe that an engineer would not be warranted in changing the direct current machinery now in place because of any increase in efficiency which might possibly result from the adoption of carefully designed alternating current machinery. However, in long distance transmission with present methods, the alternating current of high frequency is essential.

Another subject closely allied with those already considered, now attracts much interest, not only among street railroad men, but among all users of power. This subject of the generation of large units from central stations and its subsequent use in smaller units in factories and other places at a considerable distance from the source, where a small amount of power is required, has progressed so far that some are inquiring if the matter is not being overdone; but it is not assuming too much to predict that the time will come when many of the smaller power stations will have to compete with these large generating plants. Elsewhere in this issue will be found references to long distance transmission, particular attention being directed to the description of the work already done at Mechanicville, N. Y. In such plants the tendency is to increase the voltage, while the general features, such as the design of the transformers, generators and other apparatus and the detail construction of the transmission line, will not vary much from the transmission plants already completed.

There is apparently some misconception regarding the cost of generating and transmitting the power from these plants. The day has not come when electrical companies will assume the responsibility of generating electricity, say, at Niagara Falls, and transmitting it for use on a large scale to New York City, and, for many reasons, such transmission cannot yet be advocated.

One feature in the general subject of the development in the field of electric traction that should have the attention of builders and engineers is the great interest in European countries, especially in England, in all matters pertaining to electric street railroads. The article printed elsewhere on this subadopting any other method than the overhead wire ject was written by a well-informed man in England, and an effort has been made in this to bring the subject up to date. It appears evident from this article and the one to follow in a week or two, prepared by the same writer, that the question of adopting any other method than the overhead wire has not received very serious consideration. It will be strange, however, if an effort is not brought to bear on some of the companies now working a road by the trolley to make them change to the conduit electric construction when the success of the New York City conduit roads becomes commonly known.

Annual Reports.

Denver & Rio Grande.—The report of this company for the year ending June 30 gives the results of a prosperous year's business, resulting in much the highest earnings since the revenue fell off about a third in 1894. The increase in gross receipts over 1897 is about 20 per cent., and with the large increase in expenses, the increase in net over 1897 is nearly 16 per cent. After paying preferred dividends of 2½ per cent., one-half per cent. more than in 1897, and deducting some $50,000 for two special accounts, the balance was $257,300, or over one-half per cent. on the common stock. The income account for the last two years, summarized, follows:

	1898.	1897.	Inc.
Gross earnings	$8,342,926	$6,945,115	$1,397,811
Operating expenses and taxes	5,017,599	4,075,336	942,263
Net earnings	$3,325,327	$2,869,779	$455,548
Other income	62,403	51,683	16,720
Total	$3,387,730	$2,921,462	$466,268
Fixed charges	2,489,227	2,417,265	71,962
Balance	$898,502	$504,196	$394,306
Dividends	591,250	473,000	118,250
Other charges	50,000	.....	50,000
Balance	257,252	31,196	226,056

The comparisons above are with low earnings, the 1897 figures having shown a falling off from those of 1896. Comparing the figures of 1898 with those of two years ago, the increase in gross is $792,000, and in net $123,000. These gains equal 14 per cent. in gross, and 3.8 per cent. in net, as compared with 20 per cent. and 15.8 per cent. respectively, when comparing 1898 with the previous year. The company's gross re-

ceipts are now $1,867,000, and the net $821,000 above the low figure of 1894, while still below the high figures of 1893 by $975,000 gross and $710,000 in net. The 1898 gross is also below the 1892 and 1891 figures, and the net has been exceeded in these and other earlier years. The gross per mile was higher in each year between 1886 and 1893 than in 1898, and the net between 1889 and 1893 inclusive.

The largest share of the gain in gross revenue is due to the growth of freight traffic, which gave $1,287,166 of the total increase of $1,397,811. In expenses, the transportation account absorbed $579,641 of the total increase of $942,263, while maintenance of equipment accounts for a further $191,149, and roadway and structures, $193,795. The most important maintenance work of the year was in continuance of relaying the line between Denver and Pueblo, which carries the heaviest traffic of the road, with 85-lb. rails, replacing the 65-lb. section, which are again put down where the rails are of still lighter weight. The entire cost of this work is included in operating charges. The 92 miles of single track between Denver and Pueblo is now laid with the heavier section; over 7,800 tons have been put down in the past year to complete the job. It is now proposed to relay the additional 28 miles of double track between these points. Four engines were bought, four-fifths of the cost being provided by the special renewal fund, the rest being charged against expenses.

President Jeffery says that the encouraging increase in earnings was due to a general improvement in business in Colorado, its mining, agricultural and manufacturing industries all doing better, while the widespread improvement throughout the country helped the company. The large increase in the cost of conducting traffic indicates an exceedingly large volume of traffic, and the figures of tonnage carried show a gain of 50 per cent. The ton-miles are not reported, nor are the total train-miles, and the ton-mile rate is also omitted. The local train-miles increased 4.6 per cent., and the local car-miles 32 per cent. The total local and foreign car-miles were 44 per cent. above the previous year's figures, but the empty car mileage increased 47 per cent. The company has arranged for the retirement of $6,382,800 first mortgage 7 per cent. bonds due in 1900, by an issue of 4½ per cent. bonds. The saving in interest charges when the transaction is complete will be $160,000 a year.

Chicago Great Western.—The report for the year to June 30 shows larger earnings, both gross and net, than in any previous year, and a balance above obligatory fixed charges equal to 3 per cent. on the preferred "A" shares. The freight and passenger receipts increased in about equal proportion, the former 15.6 per cent., and the latter 14.6 per cent., while the gain in the total gross revenue was 15 per cent. The gain in net earnings is 30½ per cent. The surplus over mandatory charges is 61 per cent. above the 1897 total. The summarized results of the last two years' operations are given below:

	1898.	1897.	Inc.
Gross earnings	$5,386,044	$4,680,860	$705,184
Operating expenses and taxes	3,950,372	3,580,588	369,784
Net earnings	1,435,671	1,100,272	335,399
Rentals	360,594	434,207	*73,613
Interest	340,238	210,752	129,486
Balance	734,839	455,313	279,526
Debenture interest paid in cash	396 524	364,451	31,983
Deb. interest in scrip	95,880	.....	95,880
Surplus	242,435	90,772	151,663

* Decrease.

The ratio of operating expenses was 70.13 per cent., against 73.23 per cent. in 1897. The gross receipts per mile of road were $5,795, or $751 above last year, and the net receipts per mile were $1,545, or $359 higher. The largest share of the increase in expenses was in the transportation and traffic accounts, these accounting for $255,600 of the total increase of $350,000, exclusive of taxes. Equipment maintenance called for $133,000, or 28½ per cent. more than in 1897, and roadbed expenses $22,500 less, being about the same amount as in 1896. The increase in the equipment account follows a saving of $64,800 last year.

President Stickney says that in the progress of the improvement every tie has been renewed and 95 per cent. of the bridges have been replaced, more than half with permanent structures. The reduction of grades, building new side tracks, ballasting, etc., which have been carried on under extensive and systematic plans for several years, were continued through the year, and the end of the work so far planned is now in sight. At Oelwin, Ia., where three divisions center shops costing $250,000 are being built. Mr. Stickney publishes a table showing the expenditures on permanent way in each of the last four years, the total being $1,620,290, an average of $405,072 for about 929 miles of road.

The tonnage increased 345,000 tons, or 23.4 per cent., the total freight carried in 1898 being 7,814,700 tons. The ton-miles and the ton-mile rate are not published, although similar statistics are given for passenger travel. The freight train-miles are reported as 2,169,000, or 8 per cent. more than in 1897. The better freight train mile earnings obtained are noticeable. This figure was $1.89 in 1898, against $1.77 in 1897, $1.55 in 1894, and $1.17 in 1891.

A New Train Resistance Formula for Motor Cars.

It appears, from the results of 20 tests recorded by Mr. S. T. Dodd, of the Civil Engineers' Club, Cleveland, O., that most of the formulae commonly used in steam railroad practice for train resistances do not apply very accurately to electric motor cars, either with or without trailers. While these 20 tests are not of sufficient number to warrant anyone in establishing a new general formula, yet the data collected by Mr. Dodd are probably as reliable as any which have been made public for electric motors; moreover, it should be added that calculated results by the proposed formula agree very well with the observed resistances. But the results as calculated by the formulas of Clark, Rankine, Wellington and Searles show unaccountable deviations at certain speeds, with the observed data. Clark's formula in particular appears to be entirely unreliable for motor cars at the rates of speed recorded.

Inasmuch as some prominence has been given to the formula as proposed by Mr. Dodd, it may be well to caution the reader as to its real value, and at the same time suggest that other experimenters apply it to tests which they have already made or may make, and see if it is possible to put Mr. Dodd's conclusions on a broader experimental basis than is now possible because of the limited data available.

Mr. Dodd puts his proposed formula in the following form:

$$R = (18 + .2V)E + (7 + .2V)T,$$

where V equals the speed in miles per hour, E equals weight of motor car in tons of 2,000 lbs. and T equals weight of trailer cars in tons of 2,000 lbs. Although this formula is put in a different form than those of the previously mentioned investigators, yet it is in practically the same general form as the Engineering News formula. It should be remarked that the expression (18+.2V)E is for the resistance due to the motor car, while the other part of the equation (7+.2V)T is for the resistance due to the trailers. The observations from which this formula was deduced were made by using T rails and it is intended to apply only for a uniform speed on a straight level track with moderately heavy cars, and it is believed to express very fairly the resistance for speeds between 25 and 50 miles an hour. The fourth column of the following table gives the results of the observations for the 20 tests, and in the last column are given the results as calculated by the proposed formula:

No. of Cars.	Speed of Train.	Weight in Tons.	Res. Lbs. Per Ton, Observed.	Res. Lbs. Per Ton, Calculated.
1	25.9	20	23.5	23.2
1	28.	21	22.	23.6
1	32.	20	25.	24.4
1	34.	21	25.7	24.8
1	36.	21	28.3	25.2
1	43.	20	27.	26.6
1	45.5	20	27.7	27.
1	47.	20	28.	27.4
1	47.5	20	27.3	27.5
1	49.5	20	25.	27.9
2	27.	35	17.7	18.7
2	39.	35	20.3	21.1
2	40.	35	25.	21.3
2	40.25	35	20.25	21.3
2	42.25	35	22.3	21.8
3	25.	50	16.	16.4
3	34.5	50	20.	18.3
3	37.6	50	18.5	18.9
6	31.8	95	18.3	15.7

In a recent number of The Engineer, London, is an important article on the growing importations into that country of iron and steel products and machinery from the United States. The writer thinks that it will not be far from the truth to say that British industry is pressed harder to-day by the Americans than by the Germans. It appears to him to be the consensus of opinion among traveled manufacturers that on this side of the water we are far ahead of the British in methods of working, and in the way in which artisans do their work. One important difference in the practice of the two countries is the large use here of automatic machinery and the willingness, indeed the eagerness, of our mechanics to use automatic machinery. Some of the British writers have said that we send iron and steel to that country simply by way of advertisement, or, perhaps, for what they elegantly call "bounce;" but the writer of this article says that it is not wise to ignore the truth—that a single firm in London is receiving steel from the United States at the rate of nearly 250 tons a year, and American steel is sent to Birmingham in large quantities. For those articles which can be made by automatic machinery the American steel is preferred; not only by the manufacturer, who gets it cheaper, but by the workman because of its uniform temper. In files we beat them also, and by many workmen the American files are preferred. Brass rods are sold from 15% to 20% cheaper than those of English make; they are drawn truer. In malleable iron castings, of course, we have a great advantage in volume of output, in promptness of delivery, in price, in quality and in finish. The writer closes by saying: "A little healthy discussion on this subject would be seasonable, and might bring out the truth in other directions than those indicated in this article."

The competitive tests of locomotive boiler coverings made by Prof. W. F. M. Goss on the Chicago & Northwestern, and briefly outlined in our issue of August 12 last, have been completed. While the results have not yet been fully worked up, we learn that the data collected are very satisfactory, and that the method used of testing different coverings under the conditions of actual service proved to be all that was expected. The results of the tests will be presented as a paper before the Western Railway Club in the near future. Some valuable information has been obtained and it is to be hoped that the report will be made in such a way that all may be benefited by the experiments.

NEW PUBLICATIONS.

Street Railway Roadbed. By Mason D. Pratt and C. A. Alden, Assoc. Members Am. Soc. C. E. New York: Street Railway Publishing Company, 1898. Octavo, 135 pages; index and illustrations.

A manual of street railroad construction is much needed, and the authors of this book have done well to collect, revise and expand their contributions to various technical publications. Their purpose has been to review the experience of the past 15 years, the era of actual development of mechanical traction on street railroads, and to give in compact form the essentials of the best practice of the day.

The book is divided into 11 chapters, four of which treat of rails, one of fastenings and joints, two of special work, one of guard rails, one of spiral curves, one of surveys and laying out work, and, finally, a chapter is devoted to specifications.

The review of the subject of rails is excellent. The development of the modern street rail is shown by numerous engravings and good descriptions, which descriptions cover pretty well the theories that the designers have endeavored to work out in metal and the performance of various designs in practice. While the center bearing rail is the most desirable from the standpoint of the railroad, there are few cities which permit its use, because of its obstruction to wagon traffic, and practice has pretty well settled down to a grooved rail, although a rail with a flat and comparatively wide "tram" is considerably used. The severity of the punishment administered by the wagon traffic is shown by some striking examples of worn sections.

The chapter on fastenings and joints is important, but in the nature of things cannot be conclusive, for in street railroad practice as well as in steam railroad practice, the joint is still an experiment.

Concerning butting joints, the authors give some interesting discussion and information. The rate of elongation of a bar of railroad steel when subjected to a tensile strain within its elastic limit, is, according to the average of a large number of tests made by the Pennsylvania Steel Co., about 0.00006 in. for 100 lbs. per square inch. Dividing the temperature coefficient by this, we get 114.6 lbs. as the strain per square inch in a rail due to a change of 1°, provided the ends are rigidly held and that there can be no lateral or vertical bending. With a change of 100°, we get a strain of 11,460 lbs. per square inch, or about one-fifth of the elastic limit, and one-ninth of the ultimate strength. But rails cannot often be laid with their rough end surfaces abutting perfectly, and it is highly improbable that a rail will be under no strain at one of the extremes of temperature, but that the point of no strain will be at an average temperature; therefore, it is not probable that the strain in a rail will ever exceed one-third the figure given above. Nevertheless there are serious mechanical objections to electric welding. The process leaves a line of demarcation between the steel that has been raised to a high heat and that which has been left in the process quite cold, which is a line of weakness, as has been proved by breakages at this line. The apparatus is cumbersome and expensive. The so-called cast welded joint has been quite satisfactory and several roads have adopted it exclusively.

Concerning the application of fish-plate splices, some useful points are brought out. It must be remembered that the rails and the splices as they come from the mill are covered with a coat of black oxide of iron. When the track is subjected to the shocks of passing wheels, this scale is reduced to powder which works out and leaves the joint loose. Before applying the joint, the scale should be removed by a light hammer, a file or a scraper. Care should be taken, especially with the broad splices necessary with deep rails, and with the large bolts used, not to draw up the nuts too tight, or the plate will be bent, which not only starts buckling in the plate, but diminishes the surface of plate and rail in contact. Several patent joints are mentioned as worth attention, these being the Wheeler, the Weber, the continuous and the Churchill.

The chapters on special work are good and that on spiral curves analyzes the conditions and gives some useful tables of the elements of these curves.

The Master Mechanics' Association.—The report of the 31st annual convention of the American Railway Master Mechanics' Association, held at Saratoga, last June, was received last week. The report contains lists of the officers and committees, the constitution and by-laws, list of members of the Association and the complete report of the official reports, papers and discussions presented at the convention. For those who are not members of the Association, it may be well to say that copies of this invaluable yearly publication can be had by addressing Mr. John W. Cloud, Secretary, The Rookery, Chicago, Ill.

TRADE CATALOGUES.

One Quarter of a Million Horse Power of Polyphase Electric Transmission Apparatus.—This very attractive trade publication of the Westinghouse Electric & Manufacturing Co. gives, in a few pages, some valuable information regarding polyphase electric transmission apparatus. The most useful part of the information is contained in a list of electrical installations, comprising 185 plants in 29 states and eight foreign countries. This list gives the particulars of an aggregate horse power of generators of 219,649, an aggregate horse power of motors and rotary transformers of 35,511, and an aggregate horse power of static transformers of 51,598, making a total horse power in Westinghouse polyphase apparatus of 306,758. The distance over which the current is transmitted ranges from one to 78 miles. Exception, however, may be taken to the statement among the introductory remarks, that "distance is immaterial." This may be sufficiently accurate as a very general statement, but even then it is misleading. The transmission of a large current over great distances has not reached that stage where the cost of the transmission line apparatus is not an important element.

In the lists of installations, it is observed that the transmission voltage is usually either below 2,200 volts or above 10,000 volts. In the more recent plants the tendency appears to be to use a voltage of over 10,000 where the length of the transmission line is considerable.

Excellent engravings are shown of the Niagara Falls plant, the generators of the Helena Water Electric Power Co., of Helena, Mont.; the Canadian Niagara Power Co., the Paper Mill of Messrs. S. D. Warren & Co., Cumberland Mills, Me., and many large dynamos and other apparatus.

The Northwestern Limited.—The Chicago & Northwestern has issued a new pamphlet describing its fast trains between Chicago and St. Paul, which are spoken of as "Twentieth century trains." The pamphlet consists chiefly of pictures, all of which are new and show the work of a real artist. The General Passenger Agent assures the reader that the popularity of this train is due, among other things, to the electric lighting and the unrivaled dining car menu and service. The first illustration in the pamphlet is of the train as a whole, traveling on the left hand track, which assures the reader that it is on the Northwestern line, few other roads running thus; and the view shows that this part of the road is equipped with electric automatic disk block signals. The illustrations are, as we said, of a high order of merit, but, as in most advertisements of this kind, the wash room in the sleeping car is about 10 ft. x 18 ft.; the floor space in the dining car is so liberal that children may easily roll nine-pins while they are waiting for their meal, and the roominess of all of the cars is astonishing. Electric lights are provided not only in all conceivable places where they are needed inside the cars, and in the vestibules, but also outside the vestibules, throwing a strong light on the station platforms and the car steps.

Bridges, Piers, Dredging Machinery, Etc.—The San Francisco Bridge Co. and the New York Dredging Co. issue a new edition of their very interesting catalogue or trade pamphlet. This shows many bridges and piers built by them; a screw pile lighthouse, dredgers, dredging and excavating machinery at work, and engravings of many important pieces of work carried out by the companies.

Pneumatic Tools.—The Chicago Pneumatic Tool Company sends us a special catalogue showing the new No. 5 Boyer and No. 6 Whitelaw Piston Air Drills for wood boring and light iron work. The pamphlet is made up principally of half tone engravings from photographs, showing these novel and useful tools at work.

The Economical Aspects of Mechanical Draft with Special Reference to Central Stations.

(*Continued from page* 631.)

same will have to be made by greater chimney height.

In the case of a fan, however, the power expended, as measured in heat units necessary to produce the same results, is under ordinary conditions only about one seventy-fifth of that necessary with a chimney. In other words, the fan renders available for utilization practically all of the heat wasted by the chimney, while it possesses the further advantage of readily creating the additional draft required when heat-abstracting devices are introduced.

The average results obtained by Roney from tests of nine plants equipped with economizers and mechanical draft were as follows:

Temperature of gases entering economizer	526 3°
Temperature of gases leaving economizer	269.6
Increase in temperature of gases	256.7
Temperature of water entering economizer	150.4
Temperature of water leaving economizer	297.1
Increase in temperature of water	146.7
Fuel saving in per cent	14.64

If we assume this saving to be accomplished in a boiler plant of 2,000 h. p. nominal rating, it is interesting to note the financial results.

Fair costs for the various items would be as follows:

Water tube boilers, set	$36,000
Economizers, set, with piping, etc	10,000
Chimney (if used), ordinary foundations	8,000
Forced draft, engine-driven fan and short stack	2,000
Induced draft, duplex engine-driven fan and short stack	3,800

The figures are manifestly approximate, particularly those for chimney and for mechanical draft, for in either case much will depend upon the foundations required, and in the latter upon the character and type of the engines employed.

On a basis of 10 lbs. of water evaporated from and at 212° per pound of coal costing $3.50 per ton of 2,000 lbs., on 312 working days of 10 hours each, the annual fuel expense for 2,000 h. p. would be $37,674. If the economizers combined with mechanical draft brought about a saving of 14.64 per cent., this would amount to $5,515 annually.

Allowing generously for depreciation on both economizers and the mechanical draft apparatus, the total fixed charges for interest, depreciation, insurance and taxes may be taken at 15% for these appliances, while the low figure of 7½% may be taken for the chimney. The account under the two conditions, therefore, stands as follows (taking the more expensive induced draft plant):

Chimney Draft Without Economizers.		Mechanical Draft with Economizers.	
First cost of chimney	$8,000	First cost of mech. draft plant and economizers	$13,800
Fixed charges, 7½%	600	Fixed charges, 15%	2,070
		Annual gross saving	5,515
		Annual net saving	4,045

The excess of first cost of the mechanical draft plant, with economizers, over the chimney plant without economizers, is $5,800. It is, therefore, evident that this excess will be far more than offset by two years' net savings, and all future savings may be considered as practically clear gain.

Of course, circumstances will greatly influence such results; but marked advantage is evident on the part of the mechanical method. Merely as a substitute for the chimney the fan costs from one-quarter to one-half as much, according to the type, not allowing for cost of extra space required by the former. The working expense for the fan in a plant of this size should not exceed 1 per cent. of total cost of the fuel, provided the exhaust steam from the fan engine is not utilized. Such waste of exhaust steam, however, could hardly be expected in a plant of this size and character.

The most direct method of saving with mechanical draft is usually in the reduction of the cost of the fuel, for with the intense fan draft finer and cheaper fuels can be burned. The intensity of draft necessary for certain of the finer fuels, as determined by Coxe, is here presented:

Kind of fuel	Rate of combustion per sq. ft. of grate per hour.	Pounds of water evap. per lb. of coal from and at 212°.	Air pressure in inches of water.	Max. limit to size of coal in ins.
Oneida pea coal	13.63	8.56	0.375	¾
" No. 1 buckwheat	13.58	7.94	0.5	⅝
" No. 2 "	11.40	8.60	0.625	⅝
" No. 3 "	11.34	8.65	1.04	⅜
Eckley No. 3 buckwheat	9.44	8.74	1.125	⅜

These coals, which are among the smallest in size, were burned on a special form of traveling grate and the air pressure was maintained in the chamber beneath by a fan. It is noticeable that with practically constant rate of combustion and exaporative efficiency, the draft required increases very rapidly as the size of the coal decreases, and it will further be noted that the higher air pressures are above those obtainable with an ordinary chimney.

The possible savings with low grade fuel and mechanical draft are evidenced in the accompanying table, which shows for a 1,000 commercial h. p. boiler plant the annual saving, based on 312 days of 10 hours each, which would result from the substitution of a cheaper fuel for, say, Cumberland coal, costing $4 a ton of 2,000 lbs. and evaporating 11 lbs. of water from and at 212° per pound of coal. Under these conditions the annual fuel expense would be $19,568. If, for instance, the very reasonable assumption is made that coal costing $2.50 a ton and evaporating only 9.5 lbs. of water is substituted, the annual saving would be $5,407, or if applied to the 2,000 h. p. plant previously under consideration the sum would be $10,814. As evidence that these figures are perfectly reasonable, it may be stated that a reduction of over $6,500 per year has been made in actual practice in a boiler plant of 1,005 h. p. nominal rating, by the introduction of mechanical draft (without economizers), and the burning of yard screenings with a slight mixture of Cumberland.

Another line of possible saving is opened up by mechanical draft as a result of its power to increase the rate of combustion and the steaming capacity of a boiler plant. As a consequence the surplus or reserve, so important in central station installation, may, to a great extent be stored in the comparatively small fan instead of in the massive and costly boilers. With proper economizer proportions any excess of waste heat with the higher rate may be utilized, and even without the economizer any such possible waste is usually offset by the saving in fixed charges. In point of fact, however, the better distribution of air, the more perfect combustion and the greater intensity of the fire which result with mechanical draft all tend to make reasonably higher rates by combustion as economical as lower rates with chimney draft.

If we accept as a fair consideration that the rating of the 2,000 h. p. plant can be reduced 20 per cent., and the remaining boilers forced with due economy to the original rating, the account will stand thus:

With Chimney Draft.		With Mechanical Draft.	
Boilers	$36,000	Boilers	$28,800
Chimney	8,000	Mechanical draft apparatus	3,800
		Saving	11,400
	$44,000		$44,000

With a total annual expenditure of $37,674 for fuel as previously figured, it is evident that a saving of $11,400 in first cost cannot readily be offset by increased fuel cost due to any possible decrease in the efficiency of the plant. In fact, the same relative results can be obtained in stationary practice that have so long been incidental to marine practice, where great savings are made in first cost by utilizing the fans for producing reserve capacity. The ready ability of mechanical draft to "pick up the load" is nowhere of greater importance than under such conditions as prevail in central station practice, where the fluctuations are sudden and great. With the chimney, the draft increases only as the temperature of the gases rises; a slow, not to say, an uneconomical process. With the fan, a mere turn of the throttle instantly changes the draft from minimum to maximum; there is no time for the steam pressure to drop and with a properly proportioned fan, having ample reserve capacity, the boilers can be continuously operated far above their nominal rating.

The convenience of mechanical draft with certain forms of mechanical stokers and its absolute necessity with others, its importance with retarders and like heat-abstracting devices, and its ready adaptability to existing plants stand out among other important advantages. Its value is not, therefore, to be measured solely by its resultant economy in one given line, but rather by the aggregate saving and convenience. Viewed in this light, it certainly cannot be passed over without the most careful consideration.

Electrical Tests of Power for Driving Wood-Working Machinery.

Prof. O. G. Dodge, U. S. N., recently made some very careful tests to determine the power required to drive wood-working machinery at the Navy Yard in Washington. As these results are typical of similar work that may be done by electric motors, some of the conditions and results as reported in the Digests of Physical Tests may be given.

With a circular rip-saw 28 in. in diameter and running at 1,200 revolutions a minute (or 8,800 lineal feet per minute), and ripping seasoned hard oak 7⅝ in. thick with a feed of 10 ft. a minute, 18.8 mech. h. p. was used. The motor and saw running idle absorbed 2.1 h. p. Other tests with rip-saws of 24, 14 and 12 in. diameter and at varying speeds of from 1,500 to 2,000 revolutions a minute, the mech. h. p. output ranged from 2.6 to 8.9 h. p.

A band-saw running at 160 revolutions a minute (or 3,017 lineal ft. a minute), required 10.4 mech. h. p. when the motor was running idle. When ripping seasoned ash 10¾ in. thick with a feed of 6 ft. a minute, but 14.8 h. p. was consumed. In ripping yellow pine 12 in. thick and running 20 ft. a minute, 17.6 h. p. was consumed.

*Water evaporat'd per lb. coal.	Cost per ton of 2,000 lbs.													
	$0.50	$0 75	$1.00	$1.25	$1 50	$1.75	$2.00	$2.25	$2.50	$2.75	$3.00	$3.25	$3 50	$3.75	$4.00
11.00											4,892	3,669	2,446	1,223	
10.50										5,474	4,193	2,912	1.630	349	
10.00									6,115	4,770	3,424	2,079	734		
9.50							8,240	6,823	5,407	3,991	2,575	1,159			
9.00						9,105	7.610	6 115	4,621	3,126	1,631	136			
8.50					10,074	8 491	6,909	5,326	3,743	2,161	578				
8.00				11,180	9,478	7.797	6,115	4.433	2,752	1,070					
7.50			12,393	10,599	8,805	7,012	5,218	3,424	1 630						
7.00	15,724	13,803	11,881	9,959	8,037	6,115	4,193	2,272	350						

*From and at 212°.

The above figures are in contrast with the work done by a band saw having a pulley 28 in. in diameter and running at 480 revolutions a minute. With a belt pulley 12 in. in diameter and 3½ in. face and with the motor belted to the saw shaft the motor consumed ⅞ h. p. when running idle, and but 1.3 h. p. when ripping seasoned oak 3 in. thick and with a speed in one-

case of 2½ ft. a minute, and in the other cases of 4 ft. a minute, the difference in speed apparently making no difference in the consumption of power.

Tests were also made with motors driving boring machines. With a speed of the bit running at 375 revolutions a minute, with the motor belted to the bit shaft and running idle, required .5 h. p. output. When boring 4-in. holes in seasoned oak at the rate of 9⅜ ft. a minute, 1.2 mech. h. p. was consumed. Similar tests running at a speed of about 750 revolutions a minute and boring holes of various thickness, showed about the same ratio of power consumed when the motor was running idle, compared with the power consumed as in the above case.

TECHNICAL.

Manufacturing and Business.

The Chicago, Peoria & Western, a new road lately incorporated, and about to be built in the interest of the Glucose Sugar Refining Co., is in the market for a new or second-hand switching engine. W. J. Gorman, 845 The Rookery, Chicago, is the General Manager.

Benjamin Wolhaupter resigned from the Railroad Supply Co., Owings Building, Chicago, on Sept. 1, having been connected with this firm since it first started. He has disposed of his interest in the various patented articles handled by the company.

Barber trucks, made by the Standard Car Truck Co., Chicago, will be used on 20 of the 50 vehicle cars now being built for the Missouri, Kansas & Texas by the Barney & Smith Car Mfg. Co., Dayton, O., and on one of two sample 80,000 lbs. capacity coal cars which the Oregon Short Line will build at its Salt Lake shops; the other car will have Fox trucks.

The Illinois Car & Equipment Company has recently appointed Wm. R. Ellis as General Superintendent of its Hegewisch Works. The company has found it necessary to increase its capacity by building a new flooring mill 80x120 ft. and a stock building 75x100 ft., and has added a line of Carse hollow chisel mortising machines, combination gang borers, etc., built by the S. A. Woods Machine Company of Boston.

Iron and Steel.

A new corporation, the Cambria Steel Co., has been formed with a capital of $24,000,000. It will lease the Cambria Iron Co. at a rental of 4 per cent. per annum on that company's capital of $8,000,000, the surplus revenue to go to the new company. The stockholders of the Cambria Iron Co. have the privilege of subscribing to three shares of the new for every share of the old company. John Lowber Welsh, Vice-President of the Cambria Iron Co. and Chairman of the Finance Committee of the Board of Directors, has said in answer to inquiries, that no overtures have been made by anyone concerning the absorption of the Cambria Iron Co.

Articles of incorporation have been filed in Missouri by the Merrill Process Steel Co. The capital stock is $100,000. The incorporators are G. Spencer Merrill, J. W. Evans, W. Frank Carter, Arthur W. Sager and George G. Pollard.

It is stated that the Schoenberger Steel Co. of Pittsburgh has given a contract to the Garrett & Campbell Engineering Co. of Cleveland for building a new rod mill with a capacity of 300 tons a day.

New Stations and Shops.

By a recent fire, the engine house, machine shop and a locomotive of the Duluth, Mississippi River & Northern were destroyed, together with all tools. The company has already begun the building of a new machine shop and engine house, and has plans for a carpenter and blacksmith shop, 40x80 ft., which will be built at once.

Newspapers state that the Missouri Pacific has contracted with H. J. Wallu for building a new passenger station at Jefferson City.

It is likely that the El Paso and Northeastern will begin work before the end of the year on new shops to be built at Alamogordo. The general plans have not yet been drawn, but in round figures the plant will probably cost, outside of tools and equipment, about $20,000.

The Boston & Maine has contracted with Dearborn Bros. to build a station at Beverly Farms, Mass., the cost, covering grading, masonry and building, amounting to $12,400. The company has also contracted with Ross & Fowler for the building of a new station at Somerville Junction, at a cost of $10,000.

It is rumored that the Louisville & Nashville, the Louisville, Henderson & St. Louis and the Illinois Central will build a new Union station in Henderson, Ky.

It is stated that the Inter-Colonial Railway of Canada is to make improvements at St. Johns, N. B., including rebuilding a wharf and putting up a new grain elevator. The company has invited tenders up to Sept. 1, for the preliminary work.

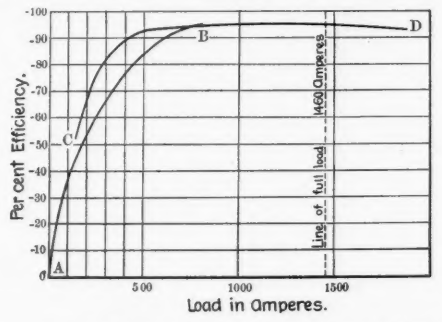
It is reported that the tunnel built for the Brockville & Ottawa at Brockville, Ontario, will be closed up, and a new dock built and other improvements made by the Canadian Pacific at a cost of $50,000.

It is stated that the Columbia & Western has purchased land in Rossland, B. C., on which new freight and passenger stations will be built.

Electric Generator Efficiency.

The accompanying curves show two conditions that are commonly met with in testing electric generators, and are here given simply to call attention to a very practical subject. The curve CD presents the ideal condition which should prevail in a well-built machine. This was plotted from tests on a generator of one of the larger companies, the machine being rated at 800 k.w. capacity. It will be observed that in this motor the maximum efficiency was reached at about 500 amperes.

It is common, however, in testing motors and dynamos to find in many cases the efficiency curve approaches more nearly the form AB, and, while the maximum efficiency is the same for both motors, one will be running with an efficiency (say, 500 amperes) that was reached by the other when running with but half that load. Running with a load of 500



amperes, the efficiency of the dynamo from which the curve AB has been plotted is 85%, while the other dynamo is about 93% at the same load. The first dynamo, if it is a 100-h.p. machine, wastes approximately 8 h.p. more than the second at this load. Assuming a horse-power can be generated on three pounds of coal per hour, this machines wastes some 35 tons a year of 300 working days. If the load runs up to, say, 750 amperes, the efficiency from that point will be practically the same in either case. It may be well to observe that these curves were obtained from simply one test, and the results of such tests are sometimes misleading. for the generators may show a wide variation of efficiency under different conditions.

Test of Street Railroad Power Plant at Cambridge.

The power plant of the Harvard Square station of the Boston Elevated Railway Co., at Cambridge, Mass., was made the subject of an elaborate test under the direction of the Edward P. Allis Company and Mr. Charles H. Bigelow, Inspecting Engineer of the railroad, on July 31. A uniform load was maintained for the purpose of ascertaining the maximum economy of the Allis triple-expansion engines in use.

Mr. C. S. Sergeant, General Manager of the Boston Elevated Railway Co., gives us the following statement of results:

Duration of test, 12.45 to 5.45 a. m.	5 hours
Average steam pressure, per sq. in.	156 lbs.
Average receiver pressure, "	10.17 lbs.
Average vacuum, "	12.06 lbs.
Revolutions of air pump per minute	52.5
I. H. P. of air pump	15.0
Total revolutions of main engine	23,043
Revolutions of main engine per minute	76.81
I. H. P. of main engine	1,545.2
Net feed water used (no allowance for leakage)	107,517 lbs.
Dry steam used (1% moisture)	106,442 lbs.
Dry steam used per hour	21,228 lbs.
Average steam per I. H. P. per hour of main engine	13.77 lbs.

Painting by Compressed Air.

The Master Painter of the Illinois Central Railroad at the Burnside Shops, sends to the Chicago Pneumatic Tool Co., under date of Aug. 2, a letter containing his experience with the use of pneumatic painting machines. The letter follows practically in full:

"These machines have been in constant use at Burnside and other points on this road for the past two years, and we no longer consider them an experiment, but an assured success. We have proven beyond a doubt that the work ordinarily done by three men can easily be accomplished by one machine, and the results obtained are in every way equal, if not superior, to the brush work, while the amount of paint required is about the same. The machine has become such a factor in our work that I do not see how we can get along without it. One beauty of this machine is that it requires only one hose—that for air—as the paint is sprayed directly from the machine, consequently there is not a continual expense for paint hose."

Street Rails for Glasgow and Halifax.

The Glasgow Corporation Tramways have put out specifications asking for bids for 2,000 tons of straight track rails, 200 tons of curve rails and 120 tons of fish plates. The rails should weigh about 98 pounds per yard for the straight track and 105 for the curve track. The carbon specification is from 0.55 to 0.65; the manganese, 0.8 to 1.0; phosphorus not to exceed 0.06; sulphur not to exceed 0.05; silicon, 0.15 to 0.2.

Bids are also asked for the supply and delivery in Halifax, Nova Scotia, of 1,000 tons of rails and 70 tons of fish plates, together with nuts and bolts; also for six sets of special switches and crossings and 46 sets of plain switches. The carbon specified here is 0.28 to 0.40.

Low-Pressure Pneumatic Signals.

The Standard Railroad Signal Co., of New York City and Arlington, N. J., has made a contract with the Pneumatic Railway Signal Co., of Rochester, N. Y., by which it secures the exclusive right to manufacture and sell the apparatus and devices of the Rochester company. The very complete and novel interlocking plant built by the Pneumatic Company for the New York Central at Buffalo was described in the Railroad Gazette of July 8 last. The engineer of the Pneumatic Company is Mr. F. L. Dodgson.

The U. S. Coaling Station in Samoa.

The following information is taken from the San Francisco Call of Aug. 21: It seems pretty definitely settled that naval authorities at Washington are about to take steps to improve the coaling station which the United States has owned at Pago Pago Harbor, in Samoa, for the past 20 years. Bids have been called for the building of a wharf and other conveniences. F. T. Chambers, of the Civil Engineering Department of the Navy, is at the Occidental Hotel, and says that bids will be accepted in Washington.

Ballast Spreader.

A new ballast spreader has recently been built at the Logansport shops of the Pennsylvania Lines West of Pittsburgh, which consists of a flat car with a wing or outrigger on each side, which is lowered when in operation to the level of the grade. The car is pushed along behind the side dump cars, from which the ballast is dumped, and spreads it out after them on either side or on both sides at a time, as desired. The spreaders are made of old rails. The car weighs complete 46,000 lbs. At a recent test, it spread 25 carloads of crushed stone in 30 minutes. The attachments for raising or lowering the wings worked too slowly at first, but have now been improved, so that they can be put in position to spread out the ballast in about five minutes.

THE SCRAP HEAP.

Notes.

The Brown system of discipline will be adopted on the Southern California and the Santa Fe Pacific Sept 1.

The Pacific Express Company has notified the Texas State officials that it will comply with the recent ruling of the State Railroad Commission requiring it to pay the war tax on bills of lading for shipments destined to points in Texas.

The Illinois Railroad & Warehouse Commission has announced its decision against the Postal Telegraph Company in the case against the Mobile & Ohio Railroad. The former filed a petition for an order to compel the railroad to distribute supplies for the erection of a telegraph line along the road. Unjust discrimination was alleged in that a like service was performed for the Western Union Telegraph Company some years ago. The Commission holds that the distribution of material between stations does not come under the statute governing unjust discrimination, nor is it illegal under the common law. The evidence showed that the Western Union was rendering special services by giving the railroad the use of certain wires for the transmission of the railroad company's messages.

The Troops Carried by Florida Railroads.

We have received from an officer of the Florida Central & Peninsular Railroad a letter from which the following is an extract:

"As to the number of troops transported by this company for the government since the opening of hostilities, we are unable to give you a correct estimate up to date, as our figures are not compiled beyond July 13. From April 15 to July 13, inclusive, we handled 22,310 men. This includes all movements under government rates, such as troops, recruits and teamsters. Since July 13 we have had a great many recruits, have handled nine regiments of infantry and three regiments of cavalry into Fernandina, Fla., one or two regiments and several artillery movements from Tampa, Fla., to Huntsville, Ala., and the East, and have had some movements into Jacksonville, aggregating not less probably than 18,000 men, so that I should say the total number handled has been from 40,000 to 45,000 men."

Both the Florida Central and the Plant System announce that they will make half fare one-way or round-trip tickets through to any point in the United States for Army and Navy officers and members of their families, traveling on personal business, and to privates on furlough, to or from Jacksonville; also, half rates to discharged soldiers returning to their homes.

Train Accident in South Africa.

A press dispatch from Johannesburg of Aug. 17 reports a collision between a passenger train and a freight 200 miles north of Capetown, in which five Europeans and 20 natives were killed, most of the victims being burned to death. A large number were injured.

Machinery Prize Competition in Italy.

The Department of State is in receipt of a note from the Italian Embassy, dated Aug. 13, 1898, requesting that publicity be given to the royal decrees inviting international competition in steam agricultural machinery, and also in machines used for the distillation of wine.

The international concourse of steam plowing engines and machines will be opened at Turin on Sept. 15, 1898, and closed not later than Oct. 15. Inventors and constructors, both native and foreign, are admittted. Exhibitors are charged with transportation expenses (both to and from the exhibition) of their own engines and machines, as well as with the ex-

penses of transportation to the locality where the trials are to take place. Requests for admission are to be forwarded to the Executive Committee not later than July 30, 1898.

A "Station Announcer" for Passenger Cars.

A passenger train of the Louisville & Nashville, running between Louisville and Lagrange, Ky., 27 miles, has for some time been equipped with Keen's electric station announcer, a device for showing inside the cars a sign bearing the name of the next station at which the train will stop. The names are changed at the proper time by an apparatus controlled by an electric current, the duty of the brakeman being simply to press a button.

Decision in Condict Controller Case.

On Thursday, last week, Judge Lacombe of the United States Supreme Court for the Southern District of New York, issued a preliminary injunction in the case of the Electric Car Company of America against the Nassau Electric Railroad Co. of Brooklyn. This injunction affects the patents controlled by the General Electric Co., governing the Electric Car Controller, which the Nassau Co. have on their cars. These controllers were made by the Steel Motor Co. and the case involves the Walker Co., which has made a number of controllers included in the Condict patent. The injunction is suspended until the next session of the Court of Appeals to give the defendants an opportunity to appeal. This is the same patent as was recently sustained at the final hearing by Judge Townsend in his suit against the user of the Walker controllers.

Electric Railroads in Shanghai.

Consul-General Goodnow recently sent information of the progress of the proposed street railroads in Shanghai. The plan to which reference is made includes the building of about 18 miles of trolley road, and he believes that American builders should bid for this concession. Briefly, the plan provides for three routes, all to be built on the overhead wire system, the lines taking the following course:

(1) From the French waterworks along the Chinese Bund (if practicable), and thence along the French and English Bunds, to the point by way of Broadway, Seward, and Yangtzepoo roads. (2) From the Bund to the Bubbling Well, by way of the Kiukiang, Kiangse, Hankau, and Nankin roads. (3) From the Shanghai Station of the Woosung-Shanghai Railway to the west gate of the Chinese city.

The Central London.

The Central London Railway is making satisfactory progress, and it is expected that the line will be ready for traffic next mid-summer. A feature of the undertaking are the lifts, which are being fitted up by the Sprague Elevator Company of New York. Their mechanism is simple, and they are capable of lifting great weights. The permanent way is being laid on the system of longitudinal sleepers laid in a bed of concrete.—Transport.

Inland Navigation in China.

Ever since China entered into commercial relations with foreign powers, steamers have been running at their pleasure to the coast and river treaty ports. The result is that trade has daily increased. Steamers, however, have hitherto never been permitted to run on the inland rivers. Soochow and Hangchow have in recent years been opened as treaty ports, and native craft plying to and from these ports, carrying passengers and merchandise, have for the most part been towed by steamers. The Tsungli Yâmen (Foreign Office) have now decided to allow small steamers, foreign or Chinese, to ply on the inland rivers in the provinces where commercial intercourse with foreign nations is carried on. The Inspector-General of Customs has drawn up and submitted a set of rules, nine in all, to be put in operation.

The inland waters of the treaty-port provinces are opened to small steamers, native or foreign, plying from treaty ports. Small steamers at treaty ports, whether plying only in the waters of the port or going thence inland, are to be registered at the customs and to take out papers, such customs papers to be renewed annually. Small steamers thus registered at the customs may ply freely in the waters of the port without reporting their movements at the customs; but if they go inland, they must report both departure and return. No unregistered steamer will be allowed to proceed inland.

"Saloons" on the Union Pacific.

The order of President Burt of the Union Pacific closing all saloons in connection with eating houses on the line in which the company has an interest will be very generally approved by the public. If the railroad company, as it does, enforces a rule of strict sobriety among its employees, and particularly its trainmen, it is inconsistent for the company to hold out temptation to them, as it did when these saloons were open. President Burt's order is therefore not only in the interest of a consistent policy, but of the general cause of temperance.—Denver News.

Luxurious Trains for the Siberian Railroad.

One of the new Siberian trains left Moscow August 2 with over 40 passengers, including several Englishmen, Americans, and Frenchmen. This is the second train specially built for "quick service" on the Great Siberian Railway. It is an improvement upon the first, which was already a marvel to Russians. The new train consists of five coaches, two for second-class and one for first-class passengers, the others being a dining and a baggage car. Besides the comforts of a bath room, with gymnastic apparatus, a library in several languages, a piano and selection of music, maps, guide-books, albums of views, an ice-cellar, and an arrangement for boiling water in three minutes by means of steam, which were found in the first train, the new one is fitted with plates which indicate the next stopping station, and, if the stoppage be over five minutes, also how long the train stops.

All the windows are protected from dust and wind by external plate glass guards; the last coach is arranged to serve as an observation car. A stationary bicycle, with arrangements for measuring in minutes and kilometers the amount of work done, a barber, who is also qualified to give medical assistance, and a superintendent, who speaks Russian, French, German and English, are among the other conveniences provided. The train will be lighted inside and out by electricity, and electric cigar lighters find a place in the dining car. A lavatory has been fitted in the second-class car, so as to be available for photographers to change plates and develop during the journey. Electric bells and portable electric reading lamps are in each compartment. The kitchen is intended to furnish a dinner for a maximum of 60 people. Paper and envelopes are to be supplied gratis at the buffet, where hot and cold drinks of all kinds are to be had; there is no charge for the barber, but two rubles is the price of a bath, for which three hours' notice beforehand must be given.

From Moscow one may now get to within a few hundred miles of Irkutsk on the sixth day. In all the chief towns, as far as Irkutsk, one or two resident English or Americans are to be found, and they gladly welcome a fellow-countryman. The French are already showing their appreciation of the opportunities offered for visiting Siberia. A special train from Paris is to leave Moscow soon, the whole time to be occupied being about one month.

A French company recently purchased for 8,000,000 francs one of the richest gold mines in the Ural; another has been sold for 5,000,000 francs; and negotiations are in progress for the purchase by a foreign company of the largest platinum mines in that district. Numbers of English and American mining experts are engaged in exploring all parts of Siberia.—Moscow letter in the London Standard.

Commercial Institute in Vladivostock.

Consul Smith writes from Moscow, July 4, 1898: "An institute is to be opened in Vladivostock in July, 1899, for the benefit of students. Special instruction will be afforded in commercial and industrial lines. All scholars who have passed the ordinary course of classes in the middle schools will be accepted without examination. The term of preparation will last five years, and there will be three divisions: Chinese-Japanese, Chinese-Korean, and Chinese-Mongolian."

A Phantom Railroad in Indian Territory.

A railroad without cars, engines or track, but with a fully developed time-table, has made its appearance in Indian Territory. The Travelers' Official Guide for August contains a time-card of the Denison & Northern, wherein trains are advertised to leave Coalgate for Dougherty and return twice each day. Wm. J. Scott of Kansas City, Mo., is given as President and General Manager. A Kansas City paper of recent date states that this road is without cars, engines or track, and this information corresponds closely with statements made in the Railroad Gazette construction columns, which show that some grading has been completed on the proposed line, but up to a short time ago no rails had been laid. The editor of the Travelers' Official Railway Guide states that, acting upon what appeared to be well-authenticated information, a time-table was printed in that publication; but the editor is now advised that the road is not completed or in operation, and the card will be omitted from subsequent issues.

The Engineers of the Fleet.

Last Thursday evening the Engineers' Club (New York), gave a dinner and reception to the engineer officers of the battleships of the United States Navy now in New York harbor, "in recognition of their services to our country, and to the enhancement of the profession of engineering, when off Santiago." As we went to press before the event took place, naturally we can say little about it. The senior engineer officers of the fleet are: Chief Engineer John L. Hannum, U. S. N., U. S. S. Brooklyn; Chief Engineer A. B. Bates, U. S. N., U. S. S. Texas; Chief Engineer R W. Milligan, U. S. N., U. S. S. Oregon; Chief Engineer Charles W. Rae, U. S. N., U. S. S. Iowa; Chief Engineer George Cowie, U. S. N., U. S. S. Indiana; Chief Engineer W. B. Bayley, U. S. N., U. S. S. Massachusetts; Passed Assistant Engineer F. M. Bennett, U. S. N., U. S. S. New York.

The New Michigan Road to Marl Beds.

The Peerless Portland Cement Company of Union City, Mich., writes that the railroad from Union City into marl beds, 3½ miles, is in operation. Trains are running regularly the entire length, making a trip every two hours, and delivering 10 carloads of marl each trip. It is a 3-ft. gage with 30-lb. rail. J. E. Saxon of Union City is President. (June 24, p. 464.)

LOCOMOTIVE BUILDING.

The Columbia Southern expects to buy one locomotive in the near future.

The Central of New Jersey has ordered four engines from the Baldwin Locomotive Works.

The Chesapeake Beach, now building, will require eight passenger locomotives. It is expected that the order will be placed within the next 60 or 90 days.

The Baldwin Locomotive Works have received an order to build two more engines for the Leopoldina Railroad of Brazil.

The Chicago, St. Paul, Minneapolis & Omaha has placed an order with the Baldwin Locomotive Works for two heavy consolidation engines.

The Rogers Locomotive Co. has just finished boxing for shipment four side tank locomotives, for the Imperial Chinese Railroad. They are handsomely finished, six-wheel passenger engines, weighing about 96,000 lbs. each, and are among the most accurately balanced of locomotives of their class.

CAR BUILDING.

The Columbia Southern expects to buy, in the near future, two passenger, 100 box and 10 flat cars.

The Cleveland, Cincinnati, Chicago & St. Louis will build 25 coal cars, of 80,000 lbs. capacity, at its own shops.

The Alberta Railway & Coal Co. contemplates increasing its equipment within the next three months by three sleeping cars

The Heinz Pickle Refrigerator & Tank Car Line has under consideration the buying of 25 refrigerator cars and has sent out specifications for 10 new tank cars.

The Chesapeake Beach expects to buy 100 passenger cars, part of them in the next 30 or 60 days. They will be of special make and most of them for summer traffic. Probably not more than 10 will be regular coaches, but all will be mounted on standard trucks, the 90 to have lighter superstructures.

The Imperial Government and Nippon railroads of Japan are considering placing in service parlor, dining and sleeping cars, in the order named. It is quite probable that a large part, if not all of this equipment will be built in America. In fact one of our car building companies is now drawing plans and specifications for some of this equipment.

The Louisville & Nashville has placed an order with the Illinois Car & Equipment Co. for 200 stock and 100 box cars of 60,000 lbs. capacity, and with the Elliott Car Co. for 200 flat cars. The stock and box cars will have Shickle, Harrison & Howard cast steel body and truck bolsters, and Chicago roofs, and the flat cars wooden bolsters. Sterlingworth brake beams, M. C. B. standard brake shoes, New York air brakes, Ajax (L. & M. pattern) brasses, Shickle, Harrison & Howard couplers, M. C. B. standard draft rigging, L. & N. standard cast-iron journal boxes, journal box lids and trucks and cast-iron wheels will be used on all the equipment. The last order given to the Elliott Car Co. was in April, and called for 250 gondola cars.

In our issue of Aug. 5 we stated that the Baltimore & Ohio had given a contract to Pullman's Palace Car Co. for 1,000 box and 1,000 gondola cars. All will be of 60,000 lbs. capacity, and the former will weigh 32,000 lbs. and measure 36 ft. long, 8 ft. 2 in. wide and 7 ft. 7¼ in. high, inside, and the latter will be 34 ft. long, 8 ft. wide, inside, and have sides 3 ft. 4 in. high. Schoen pressed steel bolsters, National hollow brake beams, Westinghouse brakes, Hewitt brasses, B. & O. pattern, Buckeye couplers, American continuous draft rigging, M. C. B. standard journal boxes and lids, Scott helical springs, B. & O. 4B. diamond pattern trucks and 33-in. cast-iron wheels will be used on all the equipment. The box cars will have B. & O. standard doors, with Dunham hangers.

In our issue of July 1, we noted the fact that Pullman's Palace Car Co. was building some freight and passenger cars for the Pecos Valley & Northeastern. The order called for 35 coal and 30 box cars and three passenger coaches. The order was given June 14, and the cars should have been delivered last month. The freight cars are of 60,000 lbs. capacity, 34 ft. long and 8 ft. 9 in. wide. The coal cars have Bettendorf bolsters and the box cars Big Four pattern bolsters, Bettendorf truck bolsters, Dunham doors and Chicago roofs. Monarch brake beams, Westinghouse brakes, Tower couplers and American continuous draft rigging will be used on the entire 65 cars. The passenger coaches are 52 ft. long, 9 ft. 3 in. wide, and equipped with M. C. B. standard axles, single 12-in. bolsters, Monarch Solid brake beams, Westinghouse brakes, Miller couplers, Baker heaters, Miller platforms, Pullman standard roofs and 33-in. cast-iron wheels. The road will probably buy 20 flat and 15 more coal cars before the end of the year, as stated last week.

The total number of cars ordered by the Nashville, Chattanooga & St. Louis from the Ohio Falls Car Mfg. Co., since March of this year was 550, 500 of which were box and 50 furniture cars. The box cars were for July and August delivery. They weigh 30,000 lbs., and are 34 ft. long over end sills, 8 ft. 9 in. wide over side sills, and 11 ft. 7 in. high from rail to top of roof at center. The furniture cars is for September delivery, will weigh 38,500 lbs. and will be 42 ft. 7¼ in. long over end sills, 9 ft. 2 in. wide over side sills and 12 ft. 9 in. high. The box cars will have wooden bolsters, and the furniture cars wrought iron body bolsters and wooden truck bolsters. The following equipment will be used for the entire order: Wrought iron axles, wood t us es, brake beams, Christie brake shoes, Westinghouse brakes, brasses of company's mixture, Janney couplers, Q & C journal box lids, Winslow roofs, French springs, diamond trucks, 33-in. cast-iron wheels and N. C. & St. L. standard doors and door fastenings, draft rigging and journal boxes.

The Southern has placed orders for 1,350 cars of 60,000 lbs. capacity, 300 flat bottom coal, with the Elliott Car Co.; 300 hopper bottom coal cars with the Lenoir Car Co.; 250 flat cars and 200 box cars with the Ohio Falls Car Mfg. Co.; 200 box cars with the Illinois Car & Equipment Co., and 100 box with the Missouri Car & Foundry Co. One hundred of the flat bottom coal cars, 50 flat cars, 100 box cars and 100 hopper bottom coal cars are for the Alabama Great Southern. The flat bottom coal cars will weigh 30,200 lbs., measure 34 ft. 6 in. long, and 8 ft. 10 in. wide and fitted with Simplex bolsters. The flat cars will weigh 27,000 lbs., measure 40 ft. long and 9 ft. wide, and equipped with Schoen bolsters. The box cars will weigh 36,100 lbs., measure 34 ft. 6 in. long, 8 ft. 10 in. wide, 9 ft. 3⅝ in. high from bottom of sill to top of running board, and be furnished with Shickle, Harrison & Howard cast steel and Fox bolsters, 100 with Shickle, Harrison & Howard steel couplers and 400 with Janney couplers, Moore doors and door fastenings and Chicago roofs. The hopper bottom cars will weigh 29,000 lbs., and have Bettendorf bolsters. All the cars will have O. H. steel axles, Sterlingworth brake beams, cast-iron M. C. B. brake shoes, Westinghouse brakes, Janney couplers (except the 100 box cars previously referred to), Butler draw-bar attachments, cast-iron journal boxes, with Morris M. C. B. steel lids, National springs, 33-in. cast-iron wheels and Southern standard trucks, brasses and paint.

In our last issue we referred to the orders of the Southern for one postal car and four combination passenger and baggage cars, from Jackson & Sharp, and 10 passenger coaches, from Barney & Smith. The postal car will weigh 86,000 lbs., measure 51 ft. long and 9 ft. 8½ in. wide, over sills, and 9 ft. 4¼ in. high from top of floor to ceiling at center and have Southern standard six-wheel trucks, Sterlingworth reinforced brakebeams, Gold heating system, in connection with Baker heater, and cast-iron journal boxes, with Morris pressed steel lids. The combination cars will weigh 90,000 lbs., measure 65 ft. long, 9 ft. 8½ in. wide and 10 ft. 6½ in. high from bottom of side sill to roof, and have the Gold heating system. The passenger cars will weigh 98 510 lbs., measure 57 ft. long, 9 ft. 8½ in. wide, outside, and 9 ft. 5⅛ in. high from top of floor to ceiling at center, and have the Gold heating system in connection with Baker heaters. All the new equipment will have Southern standard trucks, O. H. steel axles, Southern standard bolsters, Sterlingworth brake beams, cast-iron brake shoes, Westinghouse brakes, Southern standard brasses, Janney three-stem couplers, Southern standard draft rigging, Pintsch gas, Sessions steel platforms, Pantasote curtains mounted on Burrowes' fixtures; National springs, Buhoup vestibules and McFee-Fuller 38-in. wheels. The passenger coaches will have Barney & Smith walk-over seats and the combination cars Hale & Kilburn walk-over seats.

The Galveston (Tex.) City Railroad expects to give an order within the next two weeks for eight closed cars, to measure 18 ft. (inside.)

According to newspaper reports, the St. Louis Car Co. has an order to build some cars for the street railroads of Kioto, Japan, and we understand this is correct, but that the number ordered was 275, instead of 175, as stated in the dispatches.

BRIDGE BUILDING.

ASHLAND, WIS.—The Commissioners of Ashland County have under consideration plans for building a bridge over White River Ravine, according to reports. Such a bridge would cost about $50,000.

CHICAGO, ILL.—Mr. J. E. Roemheld and Mr. John J. Gallery have been awarded a contract for erecting three highway bridges at the crossings of the North Branch of the Chicago River at Lawrence avenue, North Fifty-ninth street and Kedzie avenue. The old bridges now at North Sixty-first street will be taken down and used for this work.

CINCINNATI, O.—Proposals will be received at the office of the Board of Trustees, Commissioners of Water Works, until Sept. 10, for building the foundations and masonry and for the superstructure of a steel railroad viaduct across Lick Run, east of the Little Miami River. Aug. Herrmann, President; Charles G. Roth, Clerk.

CRANBROOK, B. C.—A local paper states that James Ray, Dominion Engineer, has recommended that a wagon bridge be built at Daily avenue, Wardner.

EASTHAMPTON, MASS.—A steel bridge, to be about 35 ft. long, will probably be built at Liberty street. J. W. Wilson, City Clerk.

EDMONTON, N. W. T.—Sealed tenders addressed to E. F. E. Roy, Secretary Department of Public Works, Ottawa, Ont., will be received until noon, Sept. 13, for building the superstructure of a railroad and general traffic bridge at Edmonton, N. W. T.

GOSHEN, IND.—The Commissioners of Elkhart County, it is reported, will build two iron bridges in Elkhart Township.

LIMA, O.—Bids are asked until Sept. 12 for building a bridge over the Ottawa River. J. C. Cronley, County Engineer, Allen County.

LOUISVILLE, KY.—The Louisville & Nashville is building and has in contemplation a number of extensive improvements on the Memphis division. Red River bridge at Clarksville, Tenn., is being replaced by a plate-girder, and will be completed within five or six weeks. The bridge over the Tennessee River, which is 1,640 feet long, is being replaced by a new one, and the work will require until next March.

MERIDEN, CONN.—Sanderson & Porter, Contractors for the Meriden & Compounce Electric Railroad Company, have let the contract for furnishing several bridges and buildings on the line of this road to the Berlin Iron Bridge Company, of East Berlin, Conn. The work consists of seven spans of bridges, varying in length from 10 ft. to 65 ft.; a car barn 50 ft. wide and 100 ft. long, and a power house 45 ft. wide and 75 ft. long. The bridges are of steel, and the buildings have steel framework, brick side walls and fireproof roofs.

PHILADELPHIA, PA.—It is stated that the Pennsylvania R. R. Co. has prepared plans for replacing, this winter, two of the drawbridges across rivers near New York.

WARREN, PA.—Bids will be received at the office of the Borough Engineer until Sept. 12 for a bridge across the mill race on Pennsylvania avenue. A. Rogers, Borough Engineer; L. T. Borchers, Chairman Bridge Committee.

WELDON, N. C.—The Atlantic Coast Line, it is stated, will build a bridge across the Roanoke River at Weldon.

WHITE SPRINGS, FLA.—It is stated that bids are asked for building a bridge, to be 125 ft. long on tubular abutments 32 ft. high.

RAILROAD LAW.—RECENT DECISIONS.

[The decisions here noted are all rendered by Federal Courts.]

An Ohio statute provides that any corporation organized under the laws of that state may borrow money, not exceeding the amount of its capital stock, and may secure the payment of the same by mortgage. Indebtedness in excess of capital is not forbidden except by implication from the statute referred to. The general rule of law is that any contract entered into by a corporation which is not authorized by its charter or by other statutes enacted for its government, is beyond its corporate power and therefore void. A railroad company, with the consent of its stockholders, executed a mortgage upon certain of its property, to secure an issue of bonds greater in amount than its capital stock. It afterwards made another mortgage covering part of the same property. Upon default in the payment of interest the owner of the latter mortgage brought an action by which he attempted to have the first mentioned mortgage set aside as invalid and its own mortgage declared a prior lien upon the property covered thereby. The plaintiff had had notice of the existence of the mortgage, the validity of which he attempted to challenge. The court holds that since the first-mentioned mortgage was made with the consent of the stockholders, and, at the time of its execution, there were no creditors, neither the plaintiff or any one else could successfully question its validity. (Decided by the Circuit Court, April, 1898, Ohio.)[1]

A municipality is declared to have no power to regulate street railroad fares except when there is reasonable public need of lower rates than those existing, and also where the rates fixed by the ordinance are not unreasonable, in view of all the conditions. Where these elements do not co-exist an ordinance which attempts to lower the rate of fare is within the inhibition of the 14th amendment to the Federal Constitution, as depriving the company of its property without due process of law, and is therefore void. In the action here noted an ordinance, requiring a street railroad company, charging 5 cent fares, to sell six tickets for 25 cents or 25 tickets for $1, when the road was only making annual net earnings of not more than 4.5 per cent. of its bona fide investment, and paying only 5 per cent. interest on its bonds, in a city where the current rate of interest on first mortgage real estate security was 6 per cent., is held to be unreasonable, unconstitutional and void. (Decided by the Circuit Court, May, 1898, Wis.)[2] A good illustration of the length to which municipal legislators will go in their zeal to require from railroad companies a full performance of their duties to the public may be found in an ordinance of the Common Council of New Orleans, which provides that it shall be "unlawful for any person, firm or corporation to operate any electric, trolley or other cars or trains on the streets of this city without first providing in some reasonable manner for the sprinkling of the street through which their cars run," and "that any person, firm or corporation violating this ordinance shall be deemed guilty of a misdemeanor, and shall be subject to a fine of $25, or 30 days' imprisonment in the parish jail, or both, in the discretion of the Recorder." The president of a street railroad company was convicted under this ordinance, and on appeal the court sets the conviction aside, declaring, in a rather contemptuous opinion, that the ordinance is unreasonable and void. The court bases its decision largely on the ground that the ordinance is so indefinite that it cannot be understood. (Decided by the Supreme Court of Louisiana, June, 1897.)[3]

A landowner, knowing that a railroad company had entered upon his land and was constructing its road there without having procured a right of way, took no measures to prevent it until the road was in operation. It is held that he could not succeed in an action to eject the company from the premises, but was restricted to an action for damages, as he was to be regarded as having acquiesced in the trespass. (Decided by the Circuit Court of Appeals. May, 1898, Washington.)[4]

A claim against a railroad company, which is in the hands of a receiver in forclosure proceedings, for rent of track privileges accruing prior to the appointment of the receiver, is not entitled, as against the holders of the bonds secured by the mortgage under foreclosure, to priority of payment out of the proceeds of the sale. (Decided by the Circuit Court of Appeals, June, 1898, Kentucky.)[5]

In the trial of an action brought by an express messenger against a railroad company to recover damages for injuries sustained by reason of the derailment of a train, it appeared that a contract existed between the defendant and the express company in whose employ the plaintiff was, to the effect that its employees were to be furnished free transportation over the railroad at their own risk. It is held that he was not bound by this contract, and, moreover, even if he had known of it, he nevertheless would have had a right to recover for injuries due to the negligence of the defendant or its employees, not his fellow servants, as under the contract between the defendant and the express company he had a right to be on the train, whether he paid his fare or not. The fact that certain persons had been tried and convicted on a charge of murder by deralling the train on the occasion of this accident is held not to be available to the railroad company as a defense. (Decided by the Circuit Court of Appeals, May, 1898, South Carolina.)[6]

1. Cent. T. Co. vs. C., H. V. & T., 87 Fed., 815.
2. Milwaukee El. vs. Milwaukee, 78 Fed., 577
3. State vs. New Orleans Ry., 39 L. R. R., 618.
4. N. Pac. vs. Murray, 87 Fed., 648.
5. L. & N. vs. Cent. T. Co., 87 Fed., 500.
6. Chamberlain vs. Pearson, 87 Fed., 420.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Boston & Albany.—Quarterly, 2 per cent., payable Sept. 30.

Rio Grande & Western.—Common, 2 per cent., payable (in preferred stock at par), Sept. 30.

Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

American Society of Civil Engineers.—Meets at the house of the Society, 220 West Fifty-seventh street, New York, on the first and third Wednesdays in each month at 8 p. m.

American Street Railway Association will hold its annual meeting at Boston Sept. 6 to 9.

Association of Engineers of Virginia.—Holds its formal meetings on the third Wednesday of each month from September to May, inclusive, at 710 Terry Building, Roanoke, at 5 p. m.

Association of Railway Superintendents of Bridges and Buildings.—Eighth annual convention, Murphy's Hotel, Richmond, Va., from Oct. 18 to 20.

Boston Society of Civil Engineers.—Meets at 715 Tremont Temple, Boston, on the third Wednesday in each month at 7.30 p. m.

Canadian Society of Civil Engineers.—Meets at its rooms, 112 Mansfield street, Montreal, P. Q., every alternate Thursday at 8 p. m.

Central Railway Club.—Meets at the Hotel Iroquois, Buffalo, N. Y., on the second Friday of January, March, May, September and November, at 2 p. m.

Chicago Electrical Association.—Meets at Room 1737, Monadnock Building, Chicago, on the first and third Fridays of each month at 8 p. m. J. R. Cravath, secretary.

Civil Engineers' Club of Cleveland.—Meets in the Case Library Building, Cleveland, O., on the second Tuesday in each month at 8 p. m. Semi-monthly meetings are held on the fourth Tuesday of each month.

Civil Engineers' Society of St. Paul.—Meets on the first Monday of each month except June, July, August and September.

Denver Society of Civil Engineers.—Meets at 3 Jacobson Block, Denver, Col., on the second Tuesday of each month except during July and August.

Engineers' Club of Cincinnati.—Meets at the rooms of the Literary Club, 25 East Eighth street, on the third Thursday of each month, excepting July and August, at 7.30 p. m.

Engineers' Club of Columbus (O.).—Meets at 12½ North High street on the first and third Saturdays from September to June.

Engineers' Club of Minneapolis.—Meets in the Public Library Building, Minneapolis, Minn., on the first Thursday in each month.

Engineers' Club of Philadelphia.—Meets at the house of the Club, 1122 Girard street, Philadelphia, on the first and third Saturdays of each month at 8 p. m., except during July and August.

Engineers' Club of St. Louis.—Meets in the Missouri Historical Society Building, corner Sixteenth street and Lucas place, St. Louis, on the first and third Wednesdays in each month.

Engineers' Society of Western New York.—Holds regular meetings on the first Monday in each month, except in the months of July and August, at the Buffalo Library Building.

Engineers' Society of Western Pennsylvania.—Meets at 410 Penn avenue, Pittsburg, Pa., on the third Tuesday in each month at 7.30 p. m.

Locomotive Foremen's Club.—Meets every second Tuesday in the clubroom of the Correspondence School of Locomotive Engineers and Firemen, 335 Dearborn street, Chicago.

Master Car and Locomotive Painters' Association.—Annual convention, Ryan Hotel, St. Paul, Minn., Sept. 13 to 16, both inclusive.

Montana Society of Civil Engineers.—Meets at Helena, Mont., on the third Saturday in each month at 7.30 p. m.

National Railroad Master Blacksmith Association.—Sixth annual convention, Boston, Sept. 6.

New England Railroad Club.—Meets at Pierce Hall, Copley Square, Boston, Mass., on the second Tuesday of each month.

New York Railroad Club.—Meets at 12 West Thirty-first street, New York City, on the third Thursday in each month at 8 p. m., excepting June, July and August.

Northwest Railway Club.—Meets on the first Tuesday after the second Monday in each month at 8 p. m., the place of meeting alternating between the West Hotel, Minneapolis, and the Ryan Hotel, St. Paul.

Northwestern Track and Bridge Association.—Meets at the St. Paul Union Station on the Friday following the second Wednesday of March, June, September and December, at 2.30 p. m.

Roadmasters' Association of America.—Annual convention will be held at the St. James Hotel, Denver, Sept. 13, 14 and 15.

St. Louis Railway Club.—Holds its regular meeting on the second Friday of each month at 3 p. m.

Southern and Southwestern Railway Club.—Meets at the Kimball House, Atlanta, Ga., on the second Thursday in January, April, August and November.

Street Railway Accountants' Association of America will hold its second annual meeting in Boston Sept. 6 to 9.

Technical Society of the Pacific Coast.—Meets at its rooms in the Academy of Sciences Building, 819 Market street, San Francisco, Cal., on the first Friday in each month, at 8 p. m.

Western Foundrymen's Association.—Meets in the Great Northern Hotel, Chicago, on the third Wednesday of each month. A. Sorge, Jr., 1533 Marquette Building, Chicago, is secretary.

Western Railway Club.—Meets in Chicago on the Third Tuesday of each month at 2 p. m.

Western Society of Engineers.—Meets in its rooms on the first Wednesday of each month at 8 p. m., to hear reports and for the reading and discussion of papers. The headquarters at the Society are at 1736-1739 Monadnock Block, Chicago.

St. Louis Railway Club.

The next meeting of the St. Louis Railway Club will be held Friday, Sept. 9. The special feature of the meeting will be an excursion to the National Stock Yards, and special arrangements have been made for the trip.

American Street Railway Association.

In addition to the notice already given in our issue of Aug. 5, page 570, and the list of papers there mentioned, also the daily programme as published last week, page 617, the following items should be of interest: The meetings will be held in the Mechanics' Hall, two floors of which will be occupied with the exhibits. More than 100 companies have engaged space, some as much as 1,500 sq. ft. Mr. Charles S. Clark is Chairman of the Committee on Exhibits. Among the companies that will occupy over 1,000 sq. ft. are the following. Taunton Locomotive Manufacturing Company, Walker Company, the Johnson Co., the Peckham Motor, Truck & Wheel Company, J. G. Brill Co., Westinghouse Electric and Manufacturing Company, General Electric Company and Elmer Morris. The first four mentioned companies will have their exhibit in the basement, where the exhibits of the following companies will also be placed: New York Car Wheel Works, Laconia Car Co., Barney & Smith Car Co., Graham Equipment Co. and Pennsylvania Car Wheel Co. On the first floor the following are among the exhibitors:

New York Car Wheel Works, Laconia Car Company, Peckham Motor Truck & Wheel Co., Graham Equipment Co., Walker Co., Pennsylvania Car Wheel Co., Ashton Valve Co., A. O. Norton, Forsyth Bros. Co., Pantasote Company, H. W. Johns Mfg. Co., Westinghouse Elec. & Mfg. Co., Pearson Jack Co., Pennsylvania Steel Co., Weber Railway Joint Mfg. Co., Cleveland Frog & Crossing Co., Cambria Iron Co., John Stephenson Co., Ltd.; Consolidated Car Heating Co., Boston Artificial Leather Co., Crosby Steam Gage & Valve Co., Charles Scott Spring Co., E. T. Burrowes Co.

Central Railway Club.

The next regular meeting of the Club will be held at the Bedell House, on Grand Island, and the occasion will be made a combination of business and pleasure for the members and their ladies.

The Committee on Entertainment, consisting of Mr. O. P. Letchworth, Chairman; Mr. H. H. Hewitt, Mr. W. H. Gardner, Mr. L. H. Van Allen and Mr. James Macbeth have made arrangements as follows: The members of the club and their guests will assemble at the Hotel Iroquois, Buffalo, N. Y., and be prepared to leave there at 10 o'clock. At the foot of Ferry street the party will embark on a steamer in waiting to convey them to the Bedell House, and which will start at 10.30 o'clock. Lunch will be served at the Bedell House at 12.30 o'clock, and the business meeting of the Club will be held at the same place at 2 o'clock. The steamer will leave on the return trip at 4.30 o'clock.

The regular meeting of the Club, which marks the resumption of the work of the organization for the ensuing season, will be convened at 2 o'clock. The docket is as follows:

Reports.—Interpretation of the Rules of Interchange as adopted at the annual meeting of the M. C. B. Association at Saratoga; committee, H. F. Ball, Chairman; H. C. McCarty, E. G. Rouse.

"Which is the more economical, a single nozzle or a double nozzle, and what should be the ratio between height of nozzle and radius of boiler?" Committee: George W. West, Chairman; John Mackenzie, John Magarvey.

Discussion.—The new Rules of Interchange.

"Is any benefit derived from the swaging of tubes in the fire-box end of locomotives? Is it advantageous to anneal the copper ferrule thoroughly be-

fore applying in either case?" Committee: E. A. Miller, Chairman; F. B. Griffith, Allan Vail.

Topical Questions Proposed by Members.—The President is very desirous that members should continue to interest themselves in this feature of the docket, as their consideration has proved of practical profit.

PERSONAL.

—Mr. F. D. Leeds, Live Stock Agent of the Chicago & Alton at Kansas City, died in Kansas City, Aug. 22.

—Mr. Frank L. Everest, Assistant Claim Agent of the Missouri Pacific, died in St. Louis, Aug. 23. He was 39 years old.

—Mr. John Lang, First Vice-President of the Fall Brook Railway, died at Block Island, R. I., Aug. 22, at the age of 72 years.

—Mr. J. B. Haylow, Chief Train Dispatcher of the Birmingham Mineral Division of the Louisville & Nashville, died in Birmingham, Ala., Aug. 21. He was 27 years of age.

—Mr. James S. Collins, an attorney of Columbia City, Ind., and builder and organizer of the Detroit, Eel River & Illinois, now a part of the Wabash, died at Columbia City, Aug. 22, in his 79th year.

—Mr. Roswell Graves Rolston, a member of the Board of Managers of the Delaware, Lackawanna & Western, and a director of the Western Union Telegraph Company, died in Babylon, L. I., Aug. 25. He was 66 years old.

—Ex-Gov. Moody Currier of New Hampshire died in Manchester, N. H., Aug. 23. He was for years prominently identified with New England railroads. He was at different times Treasurer of the Concord & Portsmouth, Treasurer of the Concord Railroad, President of the Eastern Railroad, and a Director in several other roads. He was 92 years of age.

—Mr. F. E. Drake of the Walker Company, Cleveland, O., has been selected as electrical adviser to Commissioner-General Ferdinand Peck of the United States to the Paris Exposition of 1900. Mr. Drake will sail for France with the Commissioner-General and party on the steamer La Touraine from New York on Sept. 3. He expects to return to this country about the middle of October, and will then resume his duties with the Walker Company.

ELECTIONS AND APPOINTMENTS.

Atchison, Topeka & Santa Fe.—Edward F. Burnett, heretofore Eastern Passenger Agent, has been appointed General Eastern Passenger Agent, with headquarters at 377 Broadway, New York.

T. M. Orr, General Agent Freight Department, with headquarters at Pittsburgh, has resigned.

Atlanta & West Point.—Capt. John A. Gee, General Passenger Agent of this road, has resigned. R. F. Place, formerly Purchasing Agent, has been appointed his successor, with headquarters at Atlanta, Ga.

Baltimore & Ohio.—L. Venus has been appointed Car Accountant, and will have charge of the car and mileage records. His headquarters will be at Camden Station, Baltimore.

J. P. White, heretofore Traveling Freight Agent, has been appointed Commercial Agent at Wilmington, Del. The appointment was effective Sept. 1.

Baltimore & Ohio Southwestern.—C. C. Riley, Superintendent of Car Service at Cincinnati, O., has been promoted to the newly created poistion of Superintendent of Transportation, and the position he formerly held will be abolished.

Canadian Pacific.—A. J. Shulman has been appointed City Passenger and Freight Agent at Buffalo, succeeding Daniel B. Worthington.

Chicago & Northwestern.—John S. George, General Agent at Milwaukee, has resigned. He is succeeded by Mr. J. H. Martin, heretofore Agent of the C. & N. W. at South Branch, Chicago.

Chicago, Milwaukee & St. Paul.—E. G. Hayden has been appointed Traveling Passenger Agent, with headquarters at Cleveland, O. David B. Gray has been appointed City Passenger Agent, New York City.

Chicago, Rock Island & Pacific.—H. J. O'Neil has resigned as Commercial Agent at New Orleans on account of ill-health. He is succeeded by E. S. Hull. (Aug. 26, p. 618.)

H. F. Morris, who has been Assistant Auditor of the General Offices at Topeka, will be transferred to Chicago, where he will occupy a similar position.

Cleveland, Canton & Southern.—W. C. Weirick, who has been Roadmaster at Canton, O., has resigned. He is succeeded by T. F. Jordan, Supervisor of the New York, Chicago & St. Louis at Stony Island, Chicago.

Columbus, Ohio River & Tidewater (Black Diamond.)—Wm. Kirkby of Toledo, President of this road, has resigned in order to become a member of the construction company. L. H. Altimus of Ripley, O., has been elected President to succeed him. E. T. Kirker has been elected Secretary. New Directors have also been elected as follows: J. C. Shumaker, E. E. Galbreath and G. Bambach.

Denver & Rio Grande.—The report that T. E. Swann had been appointed General Passenger and Ticket Agent, with headquarters at Denver, Colo., is incorrect. Mr. Swann's position is that of Assistant General Passenger and Ticket Agent, which he has held since Jan. 1, 1896. S. K. Hooper is General Passenger and Ticket Agent.

Erie.—D. M. Bowman, Chief Clerk in the Texas & Pacific's Passenger Department, has been appointed to a similar position with the Erie at Chicago.

Fall Brook.—At a meeting of the Directors, held in Corning, N. Y., Aug. 28, Daniel N. Beach was elected First Vice-President, to succeed John Lang, deceased. John N. Lang has been elected Second Vice-President, vice Mr. Beach. Wm. Howell was elected Assistant Treasurer.

Florida Central & Peninsula.—Frank C. Wright, heretofore Chief Clerk to Assistant General Passenger Agent C. A. Benscoter of the Southern, has been appointed District Passenger Agent of the F. C. & P., with headquarters at Jacksonville.

Florida East Coast.—The office of General Freight Agent, lately held by W. J. Jarvis, assigned to other duties, has been abolished. H. S. Kealhofer has been appointed Assistant General Freight Agent and assigned to such duties as were heretofore performed by the General Freight Agent. (Aug. 26, p. 618.)

Great Northern.—R. H. Martin, District Freight Agent at Pittsburgh, Pa., has resigned.

L. B. Button has been appointed Superintendent of the Montana Division, with headquarters at Havre, Montana, in place of P. Nolan, resigned. F. J. Hawn has been appointed Assistant Superintendent of the Cascade Division, with headquarters at Everett, Wash.

H. A. Jackson has been appointed General Agent at Spokane, Wash.

Gulf, Beaumont & Great Northern.—S. A. McNeely has been appointed Superintendent of the new line of this road, now building between Sabine Pass and Jefferson, Tex.

Interoceanic of Mexico.—E. W. Howe has been appointed General Agent at 29 Broadway, New York.

Kansas City, Pittsburgh & Gulf.—J. M. Carriere has been appointed Soliciting Freight Agent, with headquarters at New Orleans.

C. E. Perkins has been appointed Chief Clerk in the general freight office, with headquarters at Kansas City, Mo., succeeding J. B. Keith, who was lately appointed Traveling Freight Agent of the Omaha & St. Louis, a newly created office, with headquarters at Omaha, Neb.

Lehigh Valley.—James Donnelly, heretofore Superintendent of the Easton & Amboy and the Lehigh Division, has been appointed Special Agent, with office at Easton, Pa. F. W. Gilcreast has been appointed Division Engineer, with office at Hazleton, Pa. A. Reeve, heretofore Roadmaster on the Mahanoy & Hazleton Division, has been appointed Supervisor. As in the other divisions, the officers of Roadmaster has been abolished.

Nashville, Chattanooga & St. Louis.—Chas. Parham, heretofore Freight Agent at Norfolk, Va., of the Southern, has been appointed Chief Clerk to H. F. Smith, General Freight Agent of the N., C. & St. L.

Oklahoma Central.—The officers of this company, referred to in the Construction Column, are: President, Herman Bruen; Vice-President, O. P. Hamilton, Salina, Kan.; Engineer, C. C. Hills, Kingfisher, Okla. The headquarters of the company will be at Watonga, Okla.

Plant System.—S. H. Dare has been appointed Commercial Agent at Montgomery, Ala., in place of S. B. Paton.

St. Louis & San Francisco.—J. H. Goodin has been appointed Division Roadmaster, Fifth Track Division, with headquarters at Rogers, Ark., vice B. Thrall, transferred to Springfield, Third Track Division. J. Mikkelson has been appointed Roadmaster of the Fourth Track Division, with headquarters at Clinton. J. M. Gaunt has been appointed Roadmaster of the Eleventh Track Division, with headquarters at Sapulpa, Ind. Ter. The territory of R. Holland, Eighth Division, has been increased by the addition of the Beaumont Branch. J. P. Sheehan has had his territory reduced by leaving out the Beaumont Branch of his jurisdiction, but it has been increased by the addition of the Kansas Midland. His headquarters will be at Wichita, Kan.

Santa Fe & Pacific.—L. D. Eversole has been appointed Superintendent of Bridges and Buildings, with headquarters at Winslow, Ariz.

St. Louis & San Francisco.—H. W. Adams has been appointed Contracting Agent at Fort Worth, Tex.

Southern.—Geo. R. Loyall, Superintendent of the Seventh, or Kentucky Division, at Louisville, has been appointed Superintendent of the Nashville Division, with headquarters at Asheville, N. C., succeeding W. O. Spriggs. (Aug. 26, p. 618.)

C. W. Hudspeth, heretofore Chief Clerk to E. T. Lamb at Norfolk, Va., has been appointed Foreign Freight Agent at Norfolk, Va., succeeding Chas. Parham, resigned.

Spokane Falls & Northern.—A. Jackson has been appointed Resident Engineer, with headquarters at Spokane, Wash., vice E. J. Robbins, Chief Engineer, resigned.

Texas & Pacific.—T. P. Fegan, heretofore Traveling Passenger Agent of the Baltimore & Ohio South Western at Dallas, Tex., has been appointed Chief Clerk in the T. & P.'s Passenger Department, succeeding D. M. Bowman.

Union Pacific.—M. Ryan, Roadmaster at Lincoln, Neb., has resigned, and W. Rick has been appointed his successor. Mr. Rick's headquarters will be at Beatrice, Neb.

Utah & Pacific.—The officers of this company referred to in the Construction column, are: President, A. W. McCune, Salt Lake, Utah; Vice-President, David Eccles, Ogden; Secretary, W. L. Hoge, Anaconda, Mont.; Treasurer, Chas. W. Nibley, Baker City, Ore. These, with Joseph F. Smith and Richard McIntosh, of Salt Lake City; Thos. D. Dee, of Ogden, and Robert C. Lund, of St. George, form the Board of Directors.

Wheeling & Lake Erie.—Samuel Sherman has been appointed Traveling Passenger Agent, with headquarters at Wheeling, W. Va. Mr. Sherman was heretofore Chief Clerk to General Agent Lawrence at Wheeling.

York Southern.—Under the reorganization referred to in the News column, W. F. Walworth of Cleveland, O., resigned, and is succeeded by D. F. Lafien of York. The new Directors are: C. I. Nes, H. H. Weber, C. H. Dempwolf and H. C. Neils of York; Geo. K. McGaw and M. H. Houseman.

RAILROAD CONSTRUCTION, Incorporations, Surveys, Etc.

ATCHISON, TOPEKA & SANTA FE.—Work is begun, according to report, on a three-mile extension east from Mulvane, Kan.

ATLANTIC COAST LINE.—The route of the Manchester & Augusta extension is from Denmark, S. C., southwest 15 miles to Barnwell on the Sievern & Knoxville (formerly the Greenwood, Anderson & Western), and thence southwest 20 miles to Robbins on the Charlestown & Western Carolina. (Aug. 19, p. 603.)

BALTIMORE & OHIO.—During the past two years the receivers of the Baltimore & Ohio have increased the yard and siding facilities on the lines east of the Ohio River to the extent of 102.46 miles. Much of this is addition to yard room, while a large number of short side tracks were laid for the benefit of industries.

BRAINERD & NORTH MINNESOTA.—Track is laid within seven miles of Bemijidi, according to report, on this extension northwest from Walkerville, Minn. A. Guthrie & Co., of St. Paul, Minn., have the contract. (July 22, p. 538.)

BRANDON & SOUTHWESTERN.—Surveys are completed for this line from Brandon, Manitoba, southwest to Waskoda, 90 miles. Three trial lines were run into Brandon. Building will begin from Deroine within a month. (Aug. 5, p. 571.)

BUFFALO, ROCHESTER & PITTSBURG.—The 2,300-ft. tunnel near Lindsay, on the Allegheny & Western extension from Punxsutawney, Pa., west 98 miles to New Castle, has been driven 450 ft. at one end and 570 at the other. The opening is 21 ft. by 14. The tunnel is expected to be completed by the end of the year. The bridge, 1,769 ft. long, across the Allegheny River, it is expected, will be completed early in January. There is a span of 239 ft., two spans of 300 ft. each, and others of 450 ft. The track will be 120 ft. above low water level. From Butler to New Castle, 35 miles, the route is subject to change, a number of surveys having been made. At New Castle connection will be made with the Northern Ohio line of the Lake Erie & Western, now building. (July 8, p. 502.)

CANADIAN ROADS.—Advices received at Vancouver, B. C., from London state that the Kootenay Railroad & Navigation Co., Ltd., has been formed with a capital stock of £100,000, to consolidate into one system Kaslo & Slocum Railroad, and International Navigation & Trading Co., Ltd., and to connect these with the Great Northern and Northern Pacific in Idaho. The Kaslo & Slocum Railroad runs from Sadom, B. C., east 28.8 miles to Kaslo on the Kootenay Lake. The Chairman of new company is H. W. Foster, M. P. Other directors are Frederic Lubbeck, a Director of the Bank of British North America; A. C. Mitchell Innes, Director British Columbia Electric R. R., and George Alexander, President International Navigation & Trading Co. The new company secures the undertaking of the Bedlington & Nelson Railway and the whole of the undertaking of the proposed American company, now being formed to construct a railway from the international boundary to Bonner's Ferry, at which point it will connect with the Great Northern.

CHARLESTON & WEST CAROLINA (Atlantic Coast Line).—Newspaper reports state that the marshes between Yemassee and Whaley on the Port Royal Division are being filled in, and that 70-lb. steel rails are being put down on the Augusta & Knoxville Division.

CHICAGO & WABASH VALLEY.—Benjamin J. Gifford of Kankakee, Ind., has organized a company to build a railroad from his farm lands, of which he owns 33,000 acres, mostly in Jasper County, to connect with the Eastern Illinois, about 10 miles.

CHICAGO GREAT WESTERN.—This company is running a preliminary line from Hampton, Ia., to Omaha, Neb., not, however, with any present intention of building, but to secure information which may be useful in the future. (Official.)

CHICAGO, PEORIA & WESTERN.—This road, whose incorporation was noted in this column Aug. 5 (p. 571), is to be built in the interest of the Glucose Sugar Refining Co., to connect its plants in Chicago, Peoria and Rockford, Ill., and Davenport, Ia. Engineers are making surveys between Chicago and Peoria. The officers of the new company are those of the Sugar Refining Co. President, C. H. Matthiessen; Secretary and Treasurer, S. T. Butler; General Manager, W. J. Gorman.

CHICAGO, ROCK ISLAND & PACIFIC.—Trains began running Aug. 28 on the Chicago, Rock Island & Texas extension from Bridgeport, Tex., west 27.25 miles to Jacksboro. (July 22, p. 538.)

CHIHUAHUA & PACIFIC.—The Nassau Construction Company of New York has the contract for building this line from Chihuahua, Mex., west to a point near Guerrero. The work is exceedingly difficult. The maximum grades are 2 per cent., and the maximum curves 10°. The bridges are to be all steel girders. Rails and rolling stock are already arriving. (Official.) E. S. Safford of Chihuahua, Mex., is General Manager. (Aug. 12, p. 586.)

CHOCTAW, OKLAHOMA & GULF.—The eastern extension of this line from Worcester, Ind. Ter., to Howe Junction on the Kansas City, Pittsburgh & Gulf, is open for traffic. On the western extension from Fort Reno, Okla. Ter., trains are running to Bridgeport, Okla., 25 miles, and the line will be open to terminus, Weatherford, Oct. 1. F. A. Molitor of South McAllister, Ind. Ter., is Chief Engineer.

COLUMBIA SOUTHERN.—Grading is completed for the entire distance on this line from Wasco, Ore., south 17 miles to Moro, and track is laid for six miles, of which only one mile is ballasted. There are 150 men and 15 teams at work. (July 8, p. 502.) D. C. O'Reilly of Wasco, Ore., is General Manager. (Official.)

DEEP WATER.—This line, which was begun early this year (Feb. 25, p. 148.), is already completed and in operation. It is simply a local road four miles in length from Deep Water, W. Va. (Official.)

DELAWARE.—Work is begun, according to report, on this new line from Delhi, N. Y., southeast 15 miles to Andes and Bovina Center. Strong & Totten, 32 Liberty street, New York, have the general contract. Henry Davis of Delhi is President. (Aug. 19, p. 603.)

DULUTH, MISSISSIPPI RIVER & NORTHERN.—On the extension from Hibbing, Miss., to Davis, 13.5 miles, the 1,200 ft. of trestle at Hibbing and 11 miles of the grading are completed and the remaining 2.5 miles will be completed in 10 days. (Aug. 19, p. 603.) Nine miles of track is laid from Hibbing

north and about seven miles of this are ballasted. The laying of track will be delayed at each of the small pile trestles. The pile driving is being done by a very simple and cheap car-driver which was built by I. N. Gray, Chief Engineer. (Official.)

EL PASO & NORTHEASTERN.—On the Alamogordo & Sacramento branch, grading is practically completed for 19 miles over the main line from Alamogordo Junction to Toboggan Gulch, and track is laid between El Paso Junction and La Luz, 4½ miles. (Aug. 26, p. 619.) A few of the bridges on the upper end of the road are not completed, but will be in about 30 days. Between 400 and 500 men are at work. The contract for grading was let to Geo. S. Good & Co. of Lock Haven, Pa., but the track is being laid by the company. The maximum grades are 5.2 per cent., and the maximum curvatures 30°. (Official.)

GALLATIN.—Work was begun Aug. 16 on this line from Three Forks, Mont., about 100 miles to coal fields. About 200 men and teams will be required. W. W. D. Turner of Boseman, Mont., is President. (Aug. 26, p. 619.)

GAUDALUPE VALLEY.—Grading is reported completed from Alligator Head, Tex., for 78 miles toward Yoakum, and track laying will begin Oct. 1. (July 22, p. 538.)

GLADSTONE & NORTHERN.—This company has been organized to build a road from Gladstone, Mich., north about 40 miles between the White Fish and Rapid rivers. Surveys are in progress. F. J. Merrian of Gladstone is President and Chief Engineer.

GREAT NORTHERN.—The last rail was laid Aug. 29 on the Fosston extension from Fosston, Minn., east 100 miles to Deer River, where connection is made with the Duluth, Superior & Western into Duluth. (Aug. 26, p. 619.)

A new siding has been built at Dalry, Traill Co., N. D., to a point 2.85 miles east of Alton Junction.

GULF, TEXAS & NORTHERN.—C. A. Breckenridge, recently appointed Chief Engineer of this line, is reported to be making surveys for this line from Orange, Tex., north about 200 miles to Marshall. Geo. W. Bancroft is among those interested. (July 29, p. 555.)

HAMPTON & BRANCHVILLE.—This line, which runs from Hampton, S. C., northeast 20 miles, to Mauldinton, is to be extended from Mauldinton, according to report, northeast 17 miles to Georges, on the South Carolina & Georgia.

HAWTHORNE, NEBAGAMON & SUPERIOR.—Grading is reported begun on the logging road of 35 miles to be built near Chippewa Falls, Wis. F. Weyerhauser of Chippewa Falls is interested.

KANSAS CITY, OSCEOLA & SOUTHERN.—The extension from Osceola, Mo., southeast 38.6 miles to Bolivar is completed, and trains were to begin running Sept. 1. The road was built by the St. Louis & San Francisco to give that company an entry into Kansas City. (June 17, p. 445.)

MARSHALL, TIMPSON & SABINE PASS.—Grading is completed for nine miles from Hardwood Mill, Tex., to Carthage, and track laid for eight miles from Hardwood Mill to Timpson on this line from Russellville north 12 miles to Carthage. There are 30 men and 16 teams at work. (July 8, p. 503.) T. S. Garrison of Timpson, Tex., is General Manager. (Official.)

MILFORD, MATAMORAS & NEW YORK.—About 100 men and several teams are reported at work on the approach to the bridge over the Delaware River on the Matamoras side. Excavations are in progress for the foundations of the culvert at the New York approach to the bridge. (Feb. 4, p. 88.)

TITUSVILLE, CAMBRIDGEVILLE & LAKE ERIE.—Estimates are being prepared, according to report, for an extension of 30 miles in Pennsylvania.

MINNEAPOLIS, ANOKA & RAINY LAKE.—Work is begun according to report on the first 16 miles to Anoka on this line from Minneapolis north about 200 miles to Grand Rapids on the Duluth, Superior & Western line of the Great Northern. Senator Washburn of Minneapolis is among those interested. Donald Grant of Faribault, Minn., has the contract. (June 3, p. 399).

MINNESOTA, IOWA & GULF.—Preliminary surveys are in progress, according to report, for this new line from New Ulm, Minn., south to Conception, Mo., on the Kansas City, Pittsburg & Gulf. Messrs. D. N. Stanton & Sons, No. 45 Broadway, New York, have the contract. J. J. Bell, of Des Moines, Ia., is President. (Aug. 5, p. 571.)

MOBILE & BAY SHORE.—This company has been incorporated in Alabama to build a line from a point on the Mobile & Ohio, near Mobile, south about 25 miles to Cedar Point and Portersville, on the Gulf of Mexico. The incorporators are W. Butler Duncan and Adrian Iselin, Jr., New York; A. J. Russell, Meridian, Miss.; J. C. Clark, H. J. Masson, C. S. Clark and E. L. Russell of Mobile. Most of these men are officials of the Mobile & Ohio.

MOBILE, JACKSON & KANSAS CITY.—Track laying and ballasting is completed for 50 miles from Mobile, Ala., to Merrill on the extension from Mobile northwest 80 miles to Jackson. (Official.) Work is suspended for the present. (March 4, p. 170.)

NASHVILLE, CHATTANOOGA & ST. LOUIS.—On the Middle Tennessee & Alabama extension, which was recently bought by this company, there has been no new grading done. (June 3, p. 399.) The track from Fayetteville, Tenn., to Madison Cross Roads, which was operated under the receiver, has been put in good order and is ready for operation. The track from Madison Cross Roads to Jeff, three miles, which was laid five or six years ago, but never put in operation, and which was entirely rotten, has also been restored and is ready for use. This makes the entire line from Fayetteville to Jeff 30.44 miles. The work has been done by the company, no contractors being engaged, except H. F. Holmes & Son, who are rebuilding the piers at Elk River, which, on account of being badly founded and too small, had to be torn down. (Official.)

NEW ROADS.—The citizens of Temple, Tex., have subscribed $30,000 toward the proposed line from Temple to Salado, 16 miles. Capt. G. E. Wilcox, of Temple, is among those interested. (July 1, p. 485.)

Knight & Sons, of Provo City, Utah, write that they are making surveys for a railroad from Strawberry Valley, Utah, west over the Divide to Utah County. The company expects to extend the line to Denver, Col., if it can get a grade not greater than 2 per cent. to Strawberry Valley. F. M. Lyman is the Engineer in charge. (Official.)

The Duluth Logging & Contracting Co. is reported to have two crews of surveyors out locating a logging road 30 miles long, from the Duluth & Iron Range at mile-post 52, to Island Lake, Minn., on the Colquet River. This road will tap a large belt of timber and go into competition with the Duluth & Northern Minnesota now building.

NORTHERN PACIFIC.—Work is begun, according to report, on a branch road up Nine-Mile Canyon, Idaho. It is stated that grading was completed for five miles several years ago.

OKLAHOMA CENTRAL.—This company, whose incorporation was noted last week, is to build a line from Oklahoma City northwest 300 miles via Okarche, Watonga and Cleo to Kiowa, Kan., with a branch from Watonga to Gage. Surveys are completed for building from Okarche to Cleo, 75 miles, and are in progress from Okarche to Oklahoma City, about 40 miles. It is expected to begin grading about Oct. 1 The officers are given under Elections and Appointments.

PHILADELPHIA, WILMINGTON & BALTIMORE (Pennsylvania).—The work of relaying the track between Bacon Hill and Northeast is expected to be finished by Sept. 11. A reverse curve between Bacon Hill and Charlestown, Md., has been eliminated.

PITTSBURG & LAKE ERIE.—At New Castle Junction this road is adding 150 ft. to the coal trestle. More than one-half of the work is completed.

PECOS VALLEY & NORTHEASTERN.—About 20 miles between Amarillo and Cañon City, on the northern end of the extension of this road from Roswell. N. Mex., northeast 206 miles to Amarillo, Tex., has been opened for business. (July 29, p. 555.)

PORTLAND, VANCOUVER & YAKIMA.—Arrangements are completed according to report for about 15 miles of extension to Yacolt Prairie. This line is successor to the Vancouver, Klickitat & Yakima, with 15 miles in operation. It is planned to complete the extension by Jan. 1. (Jan. 28, p. 71.)

RARITAN TERMINAL & TRANSPORTATION CO.—This company has been incorporated in New Jersey with a capital stock of $50,000 to build a railroad in Perth Amboy. The incorporators are: Adolph Lewisholm and Jesse Lewisholm, New York; James C. McCoy, W. E. Tobey, Perth Amboy; Joseph Rechert, Hoboken; Sidney Riddlestorffer, Upper Montclair, and Edgar Buffum, Newark.

RICHMOND, PETERSBURG & CAROLINA.—W. P. Chapman, who had the contract for building a portion of this road, has sold his contract to the Colonial Construction Co., a new corporation, which will build the line. E. A. Green of New York has been elected President of the Construction Co., and takes charge of the building. C. W. Jackson, formerly of the Chapman Co., has been elected Vice-President of the Colonial Co., and E. S. Phelps, Secretary. At a recent meeting of the Board of Directors arrangements were completed for the early completion of the section from Petersburg to Ridgeway, N. C. (Aug. 26, p. 619.)

SAN FRANCISCO & SAN JOAQUIN VALLEY.—Track is laid into Tulare from Visalia, and there still remains 14 miles of track to be laid into Corcoran Junction on the main line. This track is going down at the rate of a mile a day. On the Franklin tunnel west from Stockton, the east heading has reached a distance of 490 ft., and the west heading 715 ft., and boring is in progress at the rate of 15 ft. a day. (Aug. 19, p. 603.)

SANTE FE, PRESCOTT & PHOENIX.—Track is reported laid for 10 miles on the extension from Prescott, Ariz., east 26 miles into the Big-Bug mining district. (June 3, p. 399.)

UNION, CORNUCOPIA & EASTERN.—Grading is begun, according to report, on this line from Union southeast about 60 miles to the Seven Devils mining country in Idaho. (July 8, p. 503.)

UTAH & PACIFIC.—This company has been incorporated in Utah with a capital stock of $1,500,000 to build the line mentioned last week under "New Roads," from Milford, Utah, southwest 80 miles to the Nevada state line. The old Pioche grade requiring only a few repairs will be used. Bids are being asked for ties and track laying. The Oregon Short Line furnishes other supplies. The Utah Construction Co., which has been incorporated in Utah with a capital stock of $10,000, has charge of the construction. The officers of the Construction Co. are: President, Robert S. Campbell; Vice-President, Walter P. Read; Secretary, H. S. Young, and Treasurer, Joseph S. Wells. The officers of the railroad are given under elections and appointments.

WABASH.—Chief Engineer Lincoln is reported to be making preliminary surveys for the proposed line from East Hannibal, Ill., north to Quincy, 15 miles. The railroad company is also said to have bought property for right of way at Quincy. The question of the extension will come up at the annual meeting of the stockholders Sept. 13. (July 22, p. 539.)

WASHINGTON COUNTY.—Track is laid, according to report, on the branch to Eastport, Me., which, with the track laid from Calais, completes the connection between those towns. William Barclay Parsons, No. 22 William street, New York, is Chief Engineer. (Aug. 19, p. 603.)

Electric Railroad Construction.

BROCKTON, MASS.—The Brockton & Whitman St. Ry. Co., it is stated, has been organized with a capital of $50,000, to build between Brockton and Whitman.

BROOKLYN, N. Y.—The application of the Brooklyn Heights R. R. Co. for authority to change the Montague street cable line to a trolley was denied by Deputy Commissioner Walton. The Deputy Commissioner stated that he would grant a permit to change to conduit electric.

CATSKILL, N. Y.—The State Railroad Commissioners have authorized an increase in the capital stock of the Catskill Electric Ry. Co. from $30,000 to $400,000. The road is two miles long, but the company contemplates building for a distance of 16 miles in Greene and adjoining counties.

CLEVELAND, O.—The Cleveland, Medina & Southern Electric Railway Co. has about 30 miles of road bed completed, which includes grading, drainage, all stone and mason work, culverts and bridges. The company writes:

We are now setting poles and brackets and distributing ties. Cuts and fills have been made, reducing grade to less than 1%. The franchises provide for the handling of freight and farm produce in bulk. It is expected to build a system of short spur tracks at distances of half a mile apart, which will hold from three to five cars each, and at each spur to build a shed for the protection of goods and wagons, and a waiting room for passengers. Taking as a basis what has already been offered us, we anticipate having enough freight to keep our line in operation through the night, during which time all this business will be handled.

JACKSON, MISS.—S. T. Carnes, of Memphis, Tenn., and Mayor of Jackson, Mr. Wharton, are interested in a project to build an electric railroad in Jackson.

LACONIA, N. H.—The Laconia St. RR. Co. has elected the following officers: H. L. Pierce, President; Charles T. Foster, Treasurer, both of Leominster, Mass., and Louis S. Pierce, Superintendent. The company will proceed at once to change the road, now operated by horses, to electric trolley. A short extension will also be built to The Weirs. (Aug. 5, p. 571.)

MICHIGAN CITY, IND.—The Northern Traction Co. was recently incorporated with a capital stock of $150,000, to build an electric road between Michigan City and Laporte. The incorporators are John W. Lovett, W. W. Huffmann, C. W. Hooven and George Nichol. (July 8, p. 266.)

MONTPELIER, VT.—The Mad River Valley Electric R. R. Co. will build a road from Montpelier to Warren, 26 miles. F. C. Kennedy, A. O. Humphrey and B. K. Nash are interested.

NEWTOWN, PA.—The Newtown Electric RR. Co. was granted a franchise by the Council of Doylestown. The Company proposes to extend its line from Newtown through Wightstown, Wicomb and Forestville to Doylestown, about 13 miles. (July 22, p. 539.)

NEW YORK, N. Y.—The Wall & Cortlandt St. Ferries Ry. Co. was recently incorporated with a capital of $1,000,000. The company is the purchaser of the franchises of the Fulton, Wall & Cortlandt St. Ferries R. R. Co., sold at foreclosure sale Aug. 25. The directors of the new company are F. D. Moffat, Charles Base, K. S. Hogg, E. L. Conant, H. W. Bean, M. E. Gill and J. P. Sheffield, all of New York.

NORFOLK, VA.—The Port Norfolk Electric Ry. Co. will build an extension to Smithfield, Va., a distance of about 27 miles. It is stated that the property owners along the route selected have subscribed for $75,000 of the additional stock.

OAKLAND, CAL.—The Oakland RR. Co. has petitioned the City Council for authority to change the motive power on its cable road to electricity. The company now operates about 16 miles of track by electricity, and 5 miles by cable.

PITTSBURGH, PA.—The following companies were recently chartered to build electric railroads in different parts of Allegheny County:

The Rankin & Hawkins St. Ry. Co. to build a road one mile long in Rankin township. Capital stock, $6,000.

The Edgewood St. Ry. Co. to build a line about one mile long in Edgewood Borough. Capital stock, $5,000.

The Wilkinsburg Connecting St. Ry. Co., to build a line six-tenths of a mile long in Wilkinsburg Borough. Capital stock, $5,000.

The Swissvale St. Ry. Co., to build a road about one mile long in Swissvale Borough. Capital stock, $5,000.

The Board of Directors, which is the same for all four companies, is composed of the following: W. E. Guy, President; J. C. Burkhart, Wm. Porter, Edward Williams, of Pittsburgh, and Harry Fisher of Allegheny.

SAGINAW, MICH.—The Saginaw & Frankenmuth Ry. Co. was recently incorporated with a capital stock of $50,000, to build an electric railroad between Saginaw and Frankenmuth, 14 miles. James E. Peter is President, and H. C. Potter, Treasurer; both of Saginaw.

STROUDSBURG, PA.—The Stroudsburg Passenger Ry. Co. will adopt the trolley and build an extension about two miles long. The company now operates a steam road from Stroudsburg to East Stroudsburg, two miles.

WATERTOWN, N. Y.—A company is organized with a capital stock of $100,000 to build an electric railroad between Watertown and Sacketts Harbor, about 10 miles. The directors are William P. Casey, James S. Ludington, James H. Kinney, H. D. Barto, Syracuse; Joseph Marrian, G. Harrison Smith, John E. Bergevin, Watertown; S. Harland Wetmore, Leyden; William H. Reese, Evans Mills.

GENERAL RAILROAD NEWS.

Railroad Earnings.

Showing the gross and net earnings for the periods ending at the dates named:

June 30:		1898.	1897.	Inc. or Dec.
Baltimore & Ohio.				
1 month	Gross	$2,408,371	$2,208,798	I. $199,573
1 "	Net	603,237	502,544	I. 100,693
12 months	Gross	27,659,753	25,582,120	I. 2,077,633
12 "	Net	7,383,663	5,570,030	I. 1,813,633
Burlington, Cedar Rapids & Northern.				
1 month	Gross	$301,321	$340,417	D. $39,096
1 "	Net	61,949	88,536	D. 26,587
6 months	Gross	1,928,513	1,846,832	I. 81,681
6 "	Net	596,478	588,346	I. 8,132
Chesapeake & Ohio.				
1 month	Gross	$1,000,978	$861,527	I. $139,451
1 "	Net	333,814	260,131	I. 73,678
12 months	Gross	11,778,557	10,708,183	I. 1,070,374
12 "	Net	3,806,250	3,421,414	I. 384,836
Cleveland, Cincinnati, Chicago & St. Louis.				
1 month	Gross	$1,209,216	$1,117,622	I. $91,594
1 "	Net	278,294	237,304	I. 40,990
12 months	Gross	14,320,094	12,117,111	I. 1,202,983
12 "	Net	3,351,726	3,252,447	I. 99,279
Delaware, Lackawanna & Western.				
12 months	Gross	$8,107,390	$7,625,191	I. $482,189
12 "	Net	3,895,636	3,675,921	I. 219,715

June 30.		1898.	1897.	Inc. or Dec.
Denver & Rio Grande.				
12 months.....	Gross	$8,342,926	$6,945,114	I. $1,397,812
12 "	Net	3,325,327	2,869,778	I. 455,549
Erie.				
12 months.....	Gross	$33,740,860	$31,497,031	I. $2,243,829
12 "	Net	8,302,822	8,164,788	I. 138,034
Lake Shore & Michigan Southern.				
3 months.....	Gross	$4,908,829	$4,878,672	I. $30,157
3 "	Net	1,619,770	1,758,417	D. 138,647
6 months.....	Gross	10,109,609	9,620,850	I. 488,759
6 "	Net	3,573,870	3,569,685	I. 4,185

July 31:		1898.	1897.	Inc. or Dec.
Atchison, Topeka & Santa Fe.				
1 month.....	Gross	$2,766,998	$2,594,231	I. $172,767
1 "	Net	479,692	464,757	I. 14,935
Canadian Pacific.				
1 month.....	Gross	$2,051,363	$2,107,002	D. $55,639
1 "	Net	730,689	919,359	D. 188,670
7 months.....	Gross	13,647,638	11,819,696	I. 1,827,942
7 "	Net	4,864,366	4,586,552	I. 277,814
Central of New Jersey.				
1 month.....	Gross	$1,034,644	$1,239,433	D. $204,789
1 "	Net	425,996	558,636	D. 132,640
7 months.....	Gross	6,782,461	6,766,031	I. 16,430
7 "	Net	2,469,595	2,367,992	I. 101,603
Chicago, Burlington & Quincy.				
1 month.....	Gross	$3,086,197	$3,043,059	I. $43,138
1 "	Net	32,075	216,005	D. 183,930
Chicago, Milwaukee & St. Paul.				
1 month.....	Gross	$2,535,192	$2,713,393	D. $178,200
1 "	Net	1,652,671	1,763,555	D. 67,316
Chicago, St. Paul, Minneapolis & Omaha.				
1 month.....	Gross	$712.200	$657,115	I. $55,085
7 months.....	Gross	4,436,746	4,103,979	I. 332,767
Cincinnati, New Orleans & Texas Pacific.				
1 month.....	Gross	$400,539	$312,602	I. $87,937
1 "	Net	143,293	101,303	I. 41,990
Denver & Rio Grande.				
1 month.....	Gross	$721.272	$698,376	I. $22.896
1 "	Net	308,563	306,183	I. 2,380
Lehigh Valley.				
1 month.....	Gross	$1,703,086	$1,607,170	I. $95,916
1 "	Net	511,959	448,815	I. 63,144
8 months.....	Gross	11,671,784	11,301,032	I. 370,752
8 "	Net	2,815,654	2,200,114	I. 615,540
Lehigh Valley Coal Co.				
1 month.....	Gross	$1,432,937	$1,455,761	D. $22,824
1 "	Net	*152,593	29,060	D. 181,653
8 months.....	Gross	9,423,041	9,293,599	I. 139,442
8 "	Net	*594,439	*262,376	I. 332,063
* Net loss.				
Northern Central.				
1 month.....	Gross	$530,815	$547,696	D. $16,881
1 "	Net	183,432	166,258	I. 17,174
7 months.....	Gross	3,543,309	3,574,088	D. 31,779
7 "	Net	835,917	978,467	D. 142,550
Pennsylvania.				
1 month.....	Gross	$5,162,295	$5,480,395	D. $318,100
1 "	Net	.....	.....	D. 110,300
7 months.....	Gross	36,525,770	35,069,970	I. 1,455,800
7 "	Net	.....	.....	D. 52,700
Pennsylvania Co.				
1 month.....	Gross	.....	.....	I. $193.700
1 "	Net	.....	.....	D. 63,200
7 months.....	Gross	.....	.....	I. 2,230,400
7 "	Net	.....	.....	D. 93,300
St. Louis & San Francisco.				
1 month.....	Gross	$497,535	$528,495	D. $30,960
1 "	Net	158,293	195,472	D. 37,179

ADDISON & SUSQUEHANNA.—A special meeting of the stockholders is called for Sept. 19, to consider the leasing of the new road to the Buffalo & Susquehanna for 25 years. The A. & S., the successor to the Addison & Pennsylvania, has been leased for some years by the Buffalo & Susquehanna. (July, p. 485.)

ASTORIA & COLUMBIA RIVER.—Suit has been brought by three contractors against the North-West Construction Co., the A. & C. R. R., and the Central Trust Co. of New York for $241,488, and $15,000 attorney's fees. The claim is made for the balance due on materials supplied and labor performed in building the road. This line runs from Astoria, Ore., along the south bank of the Columbia River to Gobble, 60.3 miles, and was open for traffic last May. (Construction Column, May 20, p. 366.)

BALTIMORE & OHIO.—Under the plan of reorganization (July 1, p. 486) the second instalment of 50 per cent. of the assessment is called for, which amounts to $1 per share on first preferred stock and $10 per share on second preferred and common stock. Payment must be made at the Mercantile Trust Co., New York, or the London & Westminister Bank, London, on or before Sept. 1.

CAROLINA & CUMBERLAND GAP.—The Southern obtains possession of this road, which runs from Aiken, S. C., to Edgefield, 24.25 miles, by lease for 37 years, from July 1, at a rental of $6,250 per annum. (July 15, p. 323.)

CHICAGO, BURLINGTON & QUINCY.—Four per cent. bonds due Sept. 1, 1921, to the amount of $68,000, have been drawn for payment at par at the New England Trust Co., Boston. (Sept. 1.)

FORT PLAIN & RICHFIELD SPRINGS.—It is understood that New York bankers have $500,000 of first mortgage 5 per cent. bonds to be used in building this line, for which it stated a contract has been agreed upon calling for its completion three months from date. This company was organized some years ago by W. Clark of Fort Plain, N. Y., to build a line from Richfield Springs to Fort Plain, 22 miles. Statement is made that the grading is completed and bridge abutments built, but that no rails are laid. (Aug. 3, 1894, p. 541; Nov. 12, 1897, p. 807.)

KENTUCKY & INDIANA BRIDGE.—According to report, 138.000 of first mortgage terminal bonds have been bought by the Southern at a price understood to be about 60. These bonds were issued in 1886 (400,000 outstanding), and are due December, 1916 The last coupon was paid in June, 1893. (Jan. 15, p. 53.)

LOUISVILLE & ST. LOUIS.—The Louisville, Evansville & St. Louis Consolidated, which took possession of this line Aug. 15, has torn up 10 miles of the eastern end of the line. (Aug. 26, p. 620.)

MANHATTAN, ALMA & BURLINGAME.—The section of the track from Alma, Kan., to Manhattan, 22.6 miles, has been removed. The M., A. & B. was sold at Auction April 19 to a representative of the Atchison, Topeka & Santa Fe. (April 29, p. 318.)

NORTHERN PACIFIC.—Special Master Carey at Milwaukee, Wis., Aug. 25, filed reports which turn over the lands in Minnesota and North Dakota, owned by the old company, to the general creditors of the road, and not to the preferred stockholders. These lands, comprising 3,738,874 acres unsold, were not covered by the mortgages foreclosed in the reorganization, and steps are in progress to include them under the new company. The claim of the preferred stockholders was that their stock was a first lien on the land, but the Special Master holds that they are to be held for all the creditors.

OHIO RIVER & CHARLESTOWN.—Holders of coupon bonds of the deed of trust of July 27 are notified to present them for liquidation to Geo. I. Hoyt, Special Master, Commercial Bank, Marion, N. C. (Aug. 5, p. 572.)

RIO GRANDE WESTERN.—This company has issued the following circular to its stockholders under date of Aug. 23:

"The auditor's completed figures of net earnings for the last fiscal year show a surplus of $220,000 beyond the full 5 per cent. paid upon the preferred stock. While the expenditures upon the property during the past years have been liberal, both for current maintenance and for improvements and betterments, it is deemed for the true interests of the stockholders to continue to make further outlays for improvements.

"The directors have therefore decided to make no cash division to the common stockholders, but to make a dividend of 2 per cent. payable in preferred stock at par, and so provide $200,000 of cash toward such betterment outlays. A further sum of $50,000 is directed to be charged to profit and loss from the balance to credit, making a total amount for betterments of $250,000. Of this, $87,000 has been expended up to June 30th, and a portion of the remainder has been authorized to be expended during the current fiscal year."

RUTLAND.—This company has nearly completed the refunding of its 1,230,900 second mortgage 5 per cent. 20-year bonds, due Aug. 1, 1898. These have been exchanged in part for new 4½ per cent. bonds, and in part for cash. (July 22, p. 540.)

ST. LOUIS, AVOYELLES & SOUTHWESTERN.—By order of the court this property was sold at auction Aug. 20 to Emile Cahlbach for $110,000. The line runs from Burkie, La., to Simmsport, 26 miles, with a branch from the main line to Markville, 10 miles. Receivers were appointed July 24, 1896. (March 18, p. 210.)

ST. LOUIS, CAPE GIRARDEAU & FORT SMITH.—A suit to recover payment of bonds and interest, amounting to $653,740, was filed in the United States Circuit Court at St. Louis Aug. 27, against this company and the Fort Smith Railway Co., which it succeeded after the reorganization of 1891. The suit was brought by Costello Lippett, Newman Erb and Henry L. Lamb, on the ground that the companies are insolvent and have defaulted on the payment of their bonds and interest. The line runs from Cape Girardeau, Mo., to Hunter, 94 miles, and went into the hands of a receiver March 4, 1893.

UNION PACIFIC, LINCOLN & COLORADO.—By mistake the foreclosure sale of this road at Lincoln Centre, Kan., Aug. 20, was entered last week under the title of "Union Pacific, Denver & Gulf." The road was bid in by W. D. Cornish, Vice-President of the Union Pacific, for $1,300,000, the upset price.

WEST JERSEY & SEASHORE (Pennsylvania).—To provide a portion of the money required for double tracking the line to Atlantic City, the Board of Directors had a meeting at Philadelphia Aug. 26, and adopted the following resolution:

"Resolved, That the privilege be given to the holders of the common capital stock of this company of subscribing at par for 8 per cent. of their holdings in said stock as registered on the books of this company at 3 p. m., Friday, Aug. 26, 1898, the subscription to be made between Sept. 1 and Sept. 15, inclusive, 1898, on which latter date the privilege will cease. Payments for the stock thus subscribed for must be made in full on or before Sept. 15, 1898, for which receipts will be given, exchangeable for new stock on or after Oct. 15, 1898. Shareholders entitled to a fraction of a share may subscribe for a full share. Provisions to be made by the Treasurer whereby shareholders may sell and assign their privileges for subscribing for said stock.

"In accordance with this resolution holders of the common capital stock will be entitled to subscribe for one (1) share of the new stock for every 12½ shares or fraction thereof of common stock held by them at the close of business this date, payment for the new stock at par—$50 per share—to be made on or before Sept. 15, 1898." (May 20, p. 368.)

YORK SOUTHERN.—This company, whose line runs from York, Pa., to Delta, 37 miles, with a branch from Delta to Peach Bottom, four miles, has been reorganized. The officers are given under Elections and Appointments. The road is a connecting line of the Northern Central & Pacific, and works in connection with those roads under a traffic agreement made two years ago, which contract has several years to run.

Electric Railroad News.

BUFFALO, N. Y.—The Buffalo, Kenmore & Tonawanda Electric road was sold to Morris Cohn of Niagara Falls, the holder of the first mortgage bonds. The price paid was $63,147.32, and with the understanding, it is stated, that Cohn satisfy later a claim for $28,000 which is held by assignees. It cost to build the road about $150,000.

BUTTE, MONT.—General Manager J R. Wharton of the Butte Consolidated Ry. Co., has applied to the Council for franchises to conduct a freight business and run freight cars on all its lines.

SEDALIA, MO.—The Sedalia Electric Ry. and Sedalia & Brown Springs Electric Ry., 15 miles of track, and the lighting plant were sold, Aug. 26, to Stewart & Co. of New York for $400,000. The two companies will be consolidated under the name of the Sedalia Electric Co. Following are the new officers: S. H. G. Stewart of New York, President; John D. Crawford of Sedalia, Vice-President, and Calton H. Reeve of New York, Secretary and Treasurer. The Directors are the above officers and A. C. Zimmerman of New York and W. H. Powell, Jr., of Sedalia.

SYRACUSE, N. Y.—The State Railroad Commissioners refused to grant the application of the Eastwood & East Syracuse R. R. Co. to build an electric railroad from Eastwood and East Syracuse, connecting with points in the city proper. The Commissioners are of the opinion that there are already sufficient railroad facilities for the two villages. The district is now served by the Syracuse & East Side Ry. Co. The franchise of the Eastwood & East Syracuse was recently leased by the Syracuse Rapid Transit Company. (Mar. 18, June 10, pp. 209, 421.)

TERRE HAUTE, IND.—Press reports state that the first mortgage bondholders' committee of the Terre Haute St. Ry. Co. has prepared an agreement under which more than a majority of the holders have deposited The time limit for receiving deposits at the Illinois Trust & Savings Bank, Chicago, is fixed at Sept. 15. (Aug. 12, p. 588.)

WILKES BARRE, PA.—The Wilkes Barre & Northern R. R. was sold through the Anthracite Savings Bank, acting as trustee, to J. W. Hollenback, E. Troxell, John Graham, John A. Schmitt, George R. Bedford, Pierce Butler and Thomas A. Barber. The new owners will make extensive improvements and will meet for organization Sept. 10. This road is about 14 miles long and the motive power is being changed from steam to electricity.

TRAFFIC.

Traffic Notes.

Owing to the yellow fever scare at Galveston, the Gulf, Colorado & Santa Fe moved their general office force to Cleburne, Aug. 28, where they will remain until the quarantine against Galveston is raised.

Kansas City is to take three days, beginning Sept. 1, to celebrate the entrance to that city of the St. Louis & San Francisco and St. Joseph & Grand Island roads. According to press dispatches, everything is to be "wide open" and a railroad man's money will not be good.

Now that the Managers of the Joint Traffic Association are back from their vacation, and have resumed their sessions, action is likely to be had on the differential question, but no decision is likely to be made for some time. The whole matter will eventually go before the Board of Arbitrators.

The Interstate Commerce Commission has refused to give another hearing in the Stock Yards Switching Case at Chicago. As the matter now stands, the Commission rules that a charge of $1 per car is sufficient, while the roads are insisting upon their charge of $2. The cattle men will probably continue the fight in the courts.

The Great Northern has given notice of its intention to make radical reductions in freight rates to the entire Red River Valley. Class rates from Duluth are to be reduced 10 cents on first-class, with a scaled reduction on other classes. This is brought about by the opening of the Fosston line, which materially shortens the distance from Duluth to the Red River country. The Northern Pacific will make corresponding reductions.

Passenger rates in the Western Passenger Association territory are still "tobogganing," and the end is not yet. The latest reductions are $5 between Chicago and St. Paul and Omaha. The Alton has given notice that its withdrawal from the present Association carries with it withdrawal from all the local associations, and that they will meet between Chicago and Kansas City any open or secret rate made between Chicago and Omaha. It is reported that the $5 rate is already in effect to Kansas City. Several meetings have been held this week, without getting any nearer a settlement of the war.

A press dispatch from Milwaukee, Aug. 25, states that the demands of the grain dealers of that city for reductions in the freight rates on grain from points in Southern Minnesota and Iowa, where Milwaukee competes with Minneapolis, have been granted. Dissatisfaction has existed for six years, and a few months ago the Interstate Commerce Commission, after an investigation, ordered a change in the rates which would make them more favorable to Milwaukee, as compared with Minneapolis. This order was not obeyed by the railroads, and the Commission was proceeding to make further investigaton, but the railroads have come to an agreement with the city and the proceedings before the Commission will be dropped.

The lines in the territory of the Southwestern Bureau have taken action similar to that taken by the lines in the Western Traffic Bureau territory, and have given notice that on and after Aug. 29 they "will not accept nor protect" any tariffs thereafter issued via their several lines, "unless such tariffs in advance of publication are authorized by the proper traffic officers." The roads signing this notice (in both territories), are: Atchison System, Rock Island, Chicago & Alton, Chicago & Northwestern System, Burlington System, Chicago, Milwaukee & St. Paul, Chicago Great Western, Missouri Pacific and Iron Mountain, Missouri, Kansas & Texas, St. Louis & San Francisco, St. Louis Southwestern, Southern Pacific, Texas & Pacific, Kansas City, Pittsburgh & Gulf, Houston & Shreveport, Cromwell & Mallory Lines.

The Canadian Lines.

The passenger officers of the Northwestern lines are disturbed over the action of their brethren of the freight departments in agreeing to submit to arbitration the question of freight differentials allowed the Canadian Pacific, fearing that it will detract from the weight of their argument before the Interstate Commerce Commission that the passenger question was not susceptible of arbitration. Vice-President Joseph Price of the Grand Trunk is quoted as saying: "Sir Charles Rivers Wilson and I had an interview with Sir William Van Horne in Montreal recently. What its results were I would not care to say at present, but we will see him again. The rate war will, of course, be the question which will be discussed, and I may say that I have high hopes of the result of the conference. I wish it were more generally understood that the war is chiefly between the Canadian Pacific and the trans-continental American lines. Unfortunately our close connections from Chicago West have made it almost impossible for us to avoid being drawn into it. We alone cannot stop the conflict, but be assured that we will leave no stone unturned to try and adjust the differences. No doubt our closer relations west of Chicago have brought us a certain addition to our business, and on the whole I do not think the war has affected our passenger earnings in the least. At the same time, we are most anxious to be at peace with the Canadian Pacific, with whom we have enjoyed such intimate relations for three years."